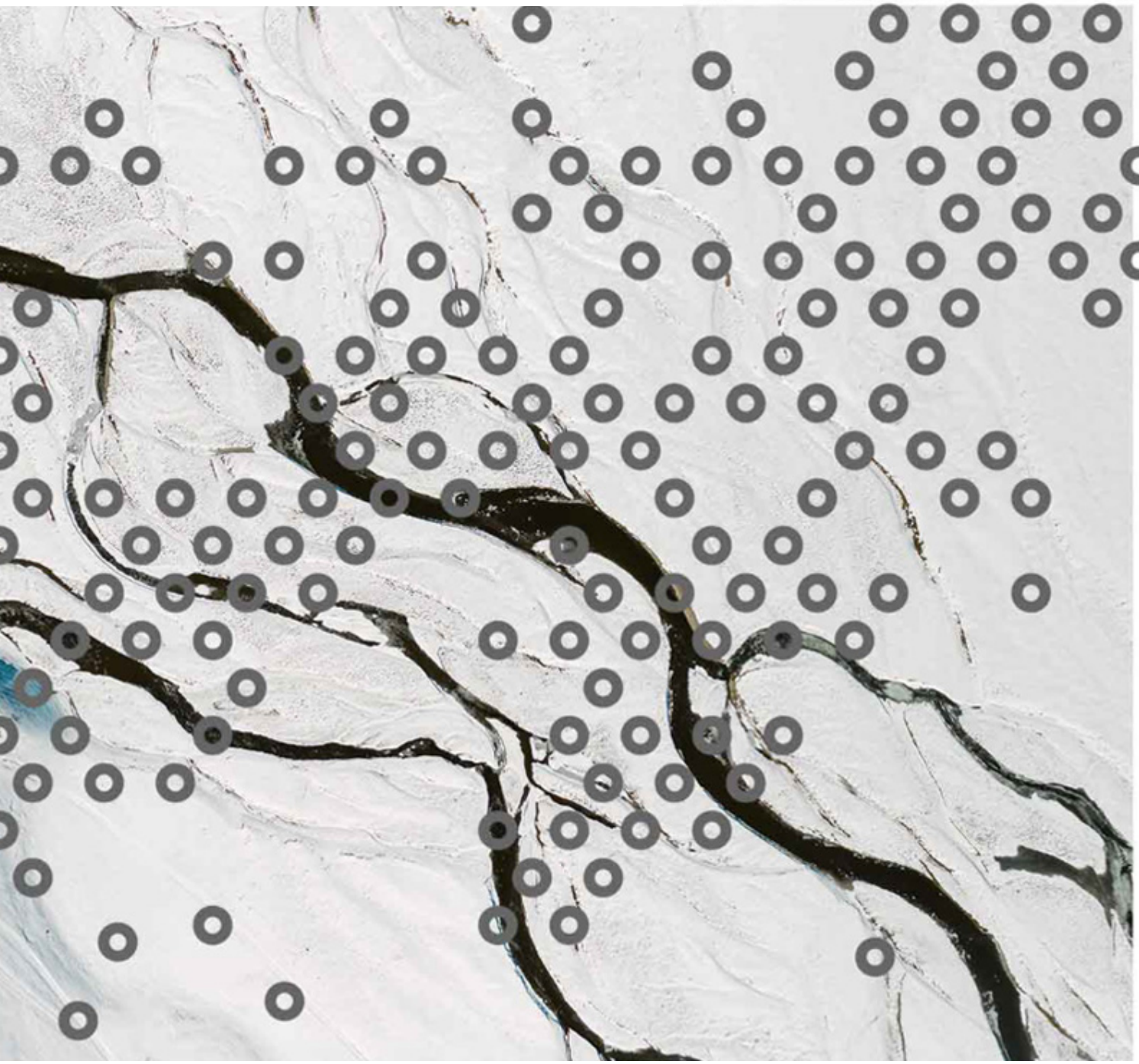

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Report delle attività di ricerca

BEYOND ALL LIMITS

INTERNATIONAL CONFERENCE
ON SUSTAINABILITY IN ARCHITECTURE,
PLANNING, AND DESIGN
11-12, 13 May_2022

edited by
Claudio Gambardella

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on Sustainability in Architecture,
Planning, and Design

edited by Claudio Gambardella

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Dipartimento di Architettura e Disegno Industriale

RR
Research activity report

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INTRODUCTIONS

Massimiliano Smeriglio*

The second edition of the *BEYOND ALL LIMITS* conference aims to address the issue of sustainability within the current international debate marked by the multifaceted response to the pandemic situation. So, the objectives of this scientific and multidisciplinary conference, spanning the fields of architecture, planning and design, were declined according to the principles of the New European Bauhaus (NEB).

Therefore, I would like to elaborate on one of the new initiatives that the Union is betting on for the coming years: the New European Bauhaus. That is an initiative will allow us not only to imagine, but also to build a "Beautiful, Sustainable, Together" future that is, an ambitious project capable of incorporating beauty, sustainability and participation in re-thinking public space, buildings and our cities.

The New Bauhaus prefigured from the historical Bauhaus, the Weimer Bauhaus of the 1920s, which transformed bourgeois society and culture through the improvement and enhancement of objects, spaces, buildings and cities. The initiative retained the interdisciplinary and transversal soul of its inspiring art movement, the only one capable of providing effective and creative responses to the challenges before us.

Three are the "fundamental and inseparable" values based on it:

1. sustainability, i.e., climate and Paris agreements, pollution and emissions, energy efficiency, biodiversity;
2. aesthetics, that means quality of experience, quality of life for everyone;
3. inclusion, but also valuing diversity, and accessibility, first of all in order to economy.

We are now in the implementation phase of the initiative, where the ideas and suggestions gathered so far are taking shape in a more concrete way with the launch of the first calls for specific and dedicated actions.

We have seen, among other things, an important increase in the budget, which, thanks to synergies between existing policies and programs, has risen from the initial 25 to 85 million euros about. An issue, that of the need to expand funding, on which the European Parliament and the friendship group in support of the initiative, of which I am very happy to be a member, have been working on from the very beginning, ever since the announcement of the launch of the NEB by President von der Leyen in her September 2020 State of the Union address.

There are many calls for proposals included in the Commission's September 15 Communication that closely affect school, university and educational realities, first of all, calls specifically dedicated to funding projects related to the New Bauhaus:

- support for pilot projects, which will act as "flagship demonstrators" by addressing NEB initiatives in an incisive, measurable and targeted way;
- support for coordination efforts that increase the adoption of innovative solutions for a sustainable, human-centered, inclusive, quality-built environment, intensify peer learning, and incentivize networking;
- the promotion of greener and more equitable lifestyles in creative and inclusive societies through architecture, design and the arts, by including with a view to so-called "hybrid environments", too;
- LIFE projects, which will directly engage the scientific, governmental, civic and business communities in order to devise and re-think ways of living and working in line with the initiative: from urban and recreational environments, to buildings, mobility programs, recycling ...

A series of actions are also planned that will contribute to the achievement of the goals of the New Bauhaus, which becomes its priority or contextual element in this way:

- the promotion of technically and socially innovative, sustainable and efficient

solutions for the improvement and preservation of an open, accessible, inclusive, resilient and low-emission cultural heritage;

- the innovation alliances under Erasmus+, targeting the higher education sectors as well as vocational education and training;
- the CoVE initiative targeted to IFP and higher education institutions, but also research institutes, science parks, innovation agencies, businesses and social partners, with the aim of promoting a bottom-up approach to vocational excellence to rapidly adapt the supply of skills to changing economic and social needs, including digital and green transitions.

In short, a lot of opportunities that outline the way to the end of 2022 and which we expect will increase, also thanks to the parallel monitoring action, in 2023, before moving to the dissemination phase, where we will have a chance to observe the concrete results of the actions taken till today.

It is also relevant to put in evidence that we are dealing with an initiative that promotes the fundamental values of the Union: human rights, freedom, democracy, equality and legally constituted state. Therefore, even in this context, in the difficult period that we are living through, with an ongoing conflict on European soil, it is our task to find ways that will allow us a concrete closeness to the Ukrainian people.

This is why in April 2022 meeting of the Culture Committee of the European Parliament I proposed the competent Commissioner Mariya Gabriel an inclusive reasoning that can extend the potentialities and opportunities of the New Bauhaus to the war-affected territories, by envisaging a strengthening of the budget, obviously. This argument, which is just beginning, concerns the possibility of using mobility and goals of the initiative to re-build public buildings in Ukraine, such as the 400 schools were destroyed by the bombing.

Currently, together with colleagues from the CULT and ITRE Committees, we are working on a draft report that we will vote next summer and that we trust will be approved by Parliament as early as September, in which we emphasize, among other things:

- our ambition to make the New Bauhaus more concrete and integrated into European policies;
- our call for the establishment of a proper program, thus endowed with its own budget commensurate with its ambitions;
- in general, the need for greater visibility and participation of citizens in the initiative and related activities, such as the festival to be held in June 9-12 2022, and the annual awards.

I'm really very confident in the abilities and potential for creation and innovation of the new generation and so I remain in the front row to support this ambitious project with curiosity and passion.

(Written introduction for the opening plenary session of the BEYOND ALL LIMITS Conference).

*Member of the European Parliament

Ornella Zerlenga*

The first edition of *BEYOND ALL LIMITS, International Conference on Sustainability in Architecture, Planning, and Design*, took place from 17 to 19 October 2018 at the Çankaya University campus in Ankara (TR), in partnership with the University of Campania 'Luigi Vanvitelli'. After a long interval due to the COVID-19 pandemic event, the second edition of the International Conference was held in Italy from 11 to 13 May 2022 at the University of Campania 'Luigi Vanvitelli'. Organized by the Department of Architecture and Industrial Design, the conference was held at the Belvedere di San Leucio (Caserta) in the *Officina Vanvitelli* spaces in partnership with the Faculty of Architecture of Cankaya University (Ankara, TR) and the University of Strathclyde, Faculty of Engineering, Department of Architecture (Glasgow, UK).

The second edition of *BEYOND ALL LIMITS* aimed to tackle the sustainability matter placing it in the current international debate also in the light of the theories of the New European Bauhaus. The term 'sustainability' has been treated in all forms of the architecture, planning, and design, to extend the boundaries and encourage cooperation between different disciplines at an international level. The issues of environmental, economic, and socio-cultural sustainability were placed at the center of discussions to go beyond the limits of sustainability, which today also must deal with the pandemic and/or post-pandemic state. To summarize the aim of this second edition, a thought by the Italian philosopher Antonio Gramsci (1891-1937) is quoted on the website of the *International Conference BEYOND ALL LIMITS 2022*: «He who is aware of himself and of everything, who feels the relationship with all other beings, has culture» [Gramsci, A. (1929-1935). Quaderni del Carcere].

Having awareness of Life in relation to all other beings is, today, the real turning point of sustainable thought and action. On January 12, 2011, in a speech given in Tucson (Arizona, USA) in memory of the victims of the Tucson attack (January 8, 2011), President Obama invited Americans to «hone our instincts for empathy» [https://www.fanpage.it/politica/strage-di-tucson-il-discorso-di-barack-obama/]. In the opinion of Jeremy Rifkin, who reflects on Obama's thinking, being empathic means being open to the plight of others [Rifkin (2011). Will We Heed President Obama's Call for a More Empathic Society? In: *HUFFPOST*. Jan 13, 2011; updated May 25, 2011. URL: http://www.huffingtonpost.com/jeremy-rifkin/post_1570_b_808549.html]. For Rifkin, empathy is the emotional and cognitive means by which we express intimacy and sociability. To empathize is to experience another's condition as if it were our own. It is to recognize their vulnerabilities and struggle to flourish and be. Empathy is the real 'invisible hand' of history. Today, empathy is beginning to stretch beyond national boundaries to include the whole of humanity. We are coming to see the biosphere as our indivisible community, and our fellow human beings and creatures as our extended evolutionary family [Rifkin (2009). *The Empathic Civilization. The Race to Global Consciousness in a World in Crisis*; Rifkin (2022). *The Age of Resilience. Reimagining Existence on a Rewilding Earth*]. In this sense, empathy is «a user-centered design approach that pays attention to the user's feelings toward a product» [McDonagh-Philp, D., Lebbon, C. (2000). The Emotional Domain in Product Design. In: *The Design Journal*, 3:1, 31-43].

Today the global issues of ecology and consumerism impose a call to the consciousness of Architecture, Planning, and Design to assume its responsibility with respect to the sustainability of a contemporary lifestyle. A sustainable process must use natural resources at a rate so that they can be regenerated naturally. Today, humanity is living in an unsustainable manner, consuming the limited natural resources of the Earth faster than it can regenerate them. The collective social effort to adapt the human consumption of these resources within a level of sustainable development is a matter of paramount importance for both the present and future of mankind. While raising the living standards of the developing world, the challenge for sustainability is to limit and manage consumption without increasing its use of the resources as well as its

environmental impact. This must be done by using strategies and technology that break the bond between economic growth and environmental damage.
A major hurdle to achieving sustainability is the alleviation of poverty. It has been widely acknowledged that poverty is one of the main sources of environmental degradation: «Poverty is a major cause and effect of global environmental problems. It is therefore futile to attempt to deal with environmental problems without a broader perspective that encompasses the factors underlying world poverty and international inequality» [Report of the World Commission on Environment and Development: Our Common Future; Brundtland Commission of the United Nations, March 20, 1987]. In this sense, empathic sustainability is the «philosophy of designing physical objects, the built environment, and services to comply with the principles of social, economic and ecological sustainability» with the intention to «eliminate negative environmental impact completely through skillful, sensitive design» [McLennan, J. F. (2004). The Philosophy of Sustainable Design].
Sustainable design requires renewable resources, minimizes the environmental impact, and connects people with the natural environment. Beyond the elimination of negative environmental impact, the new concept of sustainability must create projects that are meaningful innovations capable of shifting human behaviors. A dynamic balance between economy and society, with the intent of generating long-term relationships between user and object/service (tangible and intangible) as well as be respectful and aware of both the environmental, social, economic, and gender differences.
In conclusion, in thanking those who attended the *BEYOND ALL LIMITS 2022 International Conference* and the partnership universities, I cannot fail to say that I am pleased with the results of this second edition both for the current and important issues addressed and for having taken place at the 'Vanvitelli' University, which commits many actions in favor of the culture of sustainability.

*Italian President of the conference
Director of DADI / Vanvitelli

Claudio Gambardella*

The second edition of *BEYOND ALL LIMITS* is from the commitment made in 2018 with colleagues of Cankaya University to host the conference at the University of Campania "Luigi Vanvitelli" and is from the need to investigate the theme of sustainability, if possible with new ways or at least to contribute to its deepening trying to follow new paths linked to opportunities and themes suggested by current events. Nowadays the sustainability is a watchword, an unavoidable principle to be taken into account in all areas of our live and overall in those that concern the project. "Sustainability is culture and the culture of the third millennium can only be sustainable" is correctly written in the research *Io sono Cultura 2021* of the SYMBOLA Foundation. However, the risk is that, 35 years after its adoption in the report "Our Common Future", the concept of sustainability turns into a hollow slogan, also exploited by marketing and media that speak of "Alliances for sustainability", between brands or banks and dioceses, "Sustainable municipalities", sustainable cars, etc. Sustainability, like every good idea of our time, the more it enters the sphere of a voracious neoliberal economy the more it moves away from its ethical aims through which it was generated. The world itself is probably becoming progressively less sustainable. "[...] sustainability is no longer only understood as the effort to preserve what existed in the past, but as a series of proposals that can prepare humanity to face an unpredictable future through support for diversity in each of its forms", is indicated in the explanation of the theme of the conference "Ripensare la sostenibilità attraverso antropologia applicata" (10th Conference of the Italian Society of Applied Anthropology, Verona, December 14-17, 2022). The shift from an exclusively "technical" idea of sustainability raised from rational and scientific thinking to an idea deeply rooted in human relationships capable of creating a new future could be a decisive factor. "The world is one only family, we are one humanity. We are united by our diversity, intelligence, creativity and compassion", evocatively the environmental scientist Vandana Shiva writes at the beginning of the first chapter of her book (2018/2020). The second edition of *BEYOND ALL LIMITS* was initially expected in 2020, but it was postponed to May 2022 due to the pandemic. In September 2021, in accordance with the Pro-rector for Information and Technology Innovation of the University, Prof. Luigi Maffei, with the Director of the Department of Architecture and Industrial Design, Prof. Ornella Zerlenga, and with Prof. Pieter De Wilde of Strathclyde University and Prof. Timuçin Harputlugil of Cankaya University who shared the role of chairs with me, it was courageously decided to hold the conference in presence in May even if COVID variants would have create a very big uncertainty. It is said Audentes fortuna iuvat, so we managed to carry out the conference in presence by introducing the hybrid mode for reasons of prudence. The Italian edition of *BEYOND ALL LIMITS* which had the aim to address the issue of sustainability by placing it in the current international debate, was inserted in the more general program of *OFFICINA VANVITELLI* written by its Scientific Coordinator, Prof. Patrizia Ranzo, and presented to the Vanvitelli University Rector, Prof. Giovanni Francesco Nicoletti. That is why the conference, which embraced the fields of architecture, planning and design, was conceived with reference to the New European Bauhaus initiative. If we had planned the conference at the end of February, we would certainly have put the relationship between sustainability and war at the centre of our reflections because of the tragedy in Eastern Europe, including every side effect over the planet, the New European Bauhaus seems to lose its importance. Nevertheless, this creative and interdisciplinary initiative proceeds without interruption as MEP Massimiliano Smeriglio has 29 put in evidence in his paper at the opening of this book; moreover, it responds to the objectives of the European Green Deal with a

human-centered design and promotes a new lifestyle in which sustainability coincides with style, thus accelerating the green transition in various sectors of our economy, such as construction, furniture, fashion, as well as in our societies and other areas of our daily lives. The three inseparable fundamental values that guide the New European Bauhaus (Sustainability, Aesthetics and Inclusion) and that the European Commission intends to project towards every country in the world, were also the guidelines of the conference. The two days of *BEYOND ALL LIMITS*, inaugurated by institutional greetings and the reports of the two Keynote Speakers, Prof. Ezio Manzini and Prof. Patrizia Ranzo, were attended by speakers from Albania, Brazil, China, Greece, Italy, Lithuania, the Netherlands, Turkey and the United Kingdom with 110 presentations divided into 18 parallel sessions and 4 young videomakers who were admitted to the round table "The Future of Sustainable Fashion" coordinated by Prof. Aguinaldo dos Santos of the Universidade Federal do Paraná of Curitiba and Prof. Roberto Liberti of Vanvitelli University. It occurs to thank all the organizations that have granted the patronage, firstly the Italian Representation of the European Commission, in particular the European Parliamentarian Massimiliano Smeriglio and his staff, then the Ministry of Ecological Transition, the Campania Region, the Municipality of Caserta, the Italian University Conference of Design, the Cumulus Association, the PhD in Architecture, Industrial Design and Cultural Heritage of Vanvitelli University, the Learning Network on Sustainability, the Order of Architects of Caserta, the SYMBOLA Foundation and the following Italian scientific societies: PROARCH, SID, SIEV, SITDA, SIU and UID. Finally, it needs to thank the entire staff of Vanvitelli University - the Rector, the Pro-rectors, the Department Director, the Directorate General, the Press Office, the Network Centre, Computer Systems and Services and the Maintenance Office – then, to the partner universities, the 87 members of the International Scientific Committee, the presidents of the sessions, all the authors and, above all, the 37 colleagues of the DADI/ Vanvitelli organizing committee who worked hard for a long time without interruption.

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Design in/for complexity.
Engendering a care-oriented society

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Design, intended here as “expert design” (Manzini, 2015), was born as an agent of modernization and has historically mainly evolved by placing itself on the Local-Global axis. The working hypothesis I will discuss in this presentation says that it is possible to modifiy this picture, and to consider it as an agent for, using Bruno Latour expression, returning down to Earth (Latour, 2018).

In my opinion, designing down to Earth is a very concrete itinerary: a radical, yet constructive self-critique, acknowledging we designers have often overseen the radical interdependences interweaving us with other terrestrials and contributing each day to shape us, and yet find the courage to think and act otherwise. This process of acknowledgement in which design recognizes its anthropocentric pitfalls and looks humbly for other paths, is not only an intellectual exercise but one that leads to action. But with which kinds of action does this engage? Bruno Latour proposes to address this question by redefining our idea of action, from “production” to “engendering” (Latour, 2020). By production, we traditionally meant a system in which nature was considered “a mere ‘factor in production’, a resource that was precisely external, indifferent to our actions” (Latour, 2018). In this view, Earth ought not be considered an agent of the system but rather a tool for the production of products. Yet, “there are not organisms on one side and an environment on the other, but a coproduction by both” (Ibidem). Instead, Latour proposes to use the word engendering to indicate a process aiming for a result which takes into account the complex net of interdependencies from which this result might depend in other words, to acknowledge that no result really just depends solely on us. To embrace this perspective, means to think and to act by considering that our actions are always just one force in a larger co-productive activity, in which also other actors play a role. To design from this perspective, stepping out of the idea of production and embracing the idea of engendering, represents to us a very concrete step to re-orient design down to Earth. In my opinion, this can help to address our question about which kinds of actions this process of acknowledgment in designing engages with: to consider our designs as an engendering practice. If design ought to be considered also a form of meaning making, then post-anthropocentric meaning making might envision actions which are meaningful in a terrestrial way: in other words, which are able to generate values which dare to look beyond the human perspective, To consider design actions from an engendering perspective – envisioning them not as reactions against nature but rather inter-actions with other terrestrial agents - helps to question the terrestrial values they generate, included their political agencies. In this spirit Latour suggests to re-orient the idea of politics, de-anthropocentrizing it. He proposes the idea of a terrestrial politics (Latour, 2018): a construction of a common world which is really “common” to all terrestrials. This means that both institutional politics and bottom-up forms of everyday politics need to undergo a process of re-orientation towards the Terrestrial attractor, becoming the construction of a more-than-human common world. The discovery of the Terrestrial attractor profoundly questions who we are and what we do, what should interest us, what we should care about, which are the matters that should really “concern” us. In times in which we no longer know how to act, we need to find again a meaning to our choices and actions. If we look at design and its ability to “make” meanings, a real challenge for the discipline lies right in front of us: to design meaningful choices and actions, framing them in this itinerary down to Earth. An itinerary in which the key word is care as it has been defined by Maria Puig de la Bellacasa in her book Matters of Care (Puig de la Bellacasa, 2017). The notion of care is not a novelty in the philosophical landscape. What is a novelty is to reposition this notion – i.e. human care directed towards other humans, as developed by philosophers such as Tronto and Fischer (Fisher & Tronto 1990; Tronto, 1993) changing it in the perspective of the care of terrestrials for other

terrestrials: “Care is everything that is done (rather than everything that ‘we’ do) to maintain, continue and re-pair ‘the world’ so that all (rather than ‘we’) can live in it as well as possible. That world includes… all that we seek to interweave in a complex, life-sustaining web (modified from Tronto, 1993, 103)” (Puig de la Bellacasa, 2017). With this modification of the original definition, Puig De la Bellacasa rids political philosophy’s idea of care from its anthropocentrism, by considering it a relational modality, going beyond the human and being an expression of the radical interdependence in which everything is reactive towards everything else. To better explain this, Puig De la Bellacasa uses the metaphor of “touch” (Ibidem) to express this caring sense of reciprocity: while one touches, one is also touched. When we care for what is around us, acknowledging our interdependence, we actually start to adhere to the deeper structure of the terrestrial ecosystem. With this redefinition of care, Puig de la Bellacasa helps us to identify a possible concrete strategy to react to the consequence of the current substantial disacknowledgment of radical interdependence: the idea of reweaving that which has become disentangled. Latour’s matters of concerns between all terrestrials become to her “matters of care” (Ibidem): we should not just be concerned, but actively care for what links us together, what is in-between us. This operation of healing is a deeply ethical task that needs to be thought of and acted upon. Designers can work to disconnect this web of life and place the anthropos above all, or to decenter it and reweave back those relationships instead and thus work in a regenerative way. What I propose here is the healing, regenerative practice of care as a concrete guideline for designers today to re-think their own work from the perspective of engendering, thus considering themselves and other humans as just one of the many other terrestrials inter-acting and forming together the Earth of which we are all part. If we designers can create anthropocentric visions disrupting the web of life, we can also work to make some significant steps forward on the itinerary down to Earth and contribute to re-weaving the web of life. This means that we can re-frame our own design actions as engendering practices aiming to continue, maintain and repair our (more-than-human) common world, envisioning where there is need for care and what we can do concretely to care. If in the last two decades in design some meaningful steps have been undertaken in this direction, one of the territories where more has happened in this sense is the one of social innovation, social innovation (Murray, Grice, and Mulgan, 2010), and more precisely of transformative social innovation (Haxeltine et al., 2013). We have social innovation (intended from here on as transformative social innovation) when creative people, faced with a problem or an opportunity, reframe the systems in which they operate, coming up with radically new solutions and putting them into practice. In the past 20 years we have witnessed a wave of this kind of social innovations. That is, bottom-up initiatives endowed with the capacity to change the socio-technical system in which they operate and attain results which are, simultaneously, solutions to individual and social problems while also working to (re)generate physical and social values. Examples of this kind of social innovations can be found in all domains of everyday life, from collaborative ways of living and working, to relational social and health services, to collaborative city making processes. Many of them are at initially driven by small groups of enthusiasts, but some progressively have the chance to grow, evolve and enter in conversation with civil servants and policy makers. When this happened, political and institutional innovations have been also produced (Manzini, 2018, Manzini, 2022). By looking at how this kind of social innovation works and by considering the quality of the interactions it comprises and the motivations driving it, we can recognize a common trait: all participants aspire to address a very practical common issue (e.g. to have access to cheap and fresh food). Nevertheless, in doing so they also tend to pay attention and often re-discover other aspects which are not necessarily related to this practical issue, such as the qualities of relationships involved, of the time spent there, of the place in which they happen to take place and of the work involved (Manzini and Tassinari, 2012). A retrospective reading of those behaviours and their results achieved, leads us to acknowledge that in social innovation motivations and results are actually multiple; hence we need to acknowledge the value of their irreducible complexity. The quality of complexity emerging from them needs to be appreciated for its intrinsic ability to adhere to the complexity of the radical interdependence

that weaves us together with all other terrestrials in profound ways. This togetherness shapes who we are today as well as the form of the common (more-than-human) world to which they contribute. In other words: the acknowledgment of complexity is the concrete way in which radical interdependency is practiced. The acknowledgment of complexity is what makes of the ways of looking at and acting in the world of those social innovation practices something radically different compared to the ones based on the over-simplifying, unifying, mechanistic models which have been predominant in the last century. If the results of our actions do not exclusively depend upon us alone, but also upon the other entities with which we inter-depend, we are also necessarily forced to come to terms with the fact that we can no longer consider ourselves at the center. This implies the need to acknowledge that we can no longer think we can really control productive processes, but rather consider ourselves and our own actions as just one of the many other agents/actions of engendering processes which are bigger than us and beyond our control. This means that transformative social innovation ought to be considered a concrete way in which people are (re)discovering that we inter-depend on one another, and that our actions are only really meaningful when they are framed within this inter-play. By engaging with very concrete issues, social innovation also engages with social values in terms of empathy, trust, and the ability and willingness to collaborate. This happens because those who participate both seek to produce relationships based on proximity, attention and care: care for people, places and all other agencies. By caring, they tend to regenerate, re-weave the web of life which has been neglected or damaged. So, social innovation not only prototypes a way out of anthropocentrism, but also strives to regenerate that which has been damaged by it. To really care however, one first needs to acknowledge the quality of complexity of the system(s) within which one operates. This is in my opinion an important lesson for designing down to Earth. This qualitative dimension of complexity (as a prerequisite for care) emerging from the observations of social innovation practices can serve also beyond the field of social innovation, as it can help to form a guideline for design practices willing to step out of anthropocentrism. Designing down to Earth might then mean caring, regenerative design practices deeply embracing the complexity of the world we all contribute to shape. If Puig De la Bellacasa's idea of care helped us to make Latour's idea of engendering more concrete, the (re)discovery of complexity we draw from social innovation helps us to make the idea of engendering, practices of care more concrete. To care and re-direct our own design practices beyond anthropocentrism, we first of all need to acknowledge and embrace complexity, to engage in systems reframing. In this process, we also need to re-frame our own design practice as engendering practice, thus also re-frame our own role as designer, acknowledging we do not have the design processes in our own hands. We are just one of the many actors inter-acting. What we can do is not so much to find solutions, easy fixes for societal issues, but rather to help to re-frame the systems from which such issues might arise. We should re-connect what has become separated (its relational perspective overlooked), acknowledge the radical interdependence connecting systems to systems, humans to humans, but also people to the planet. We ought to help further articulate the entanglements between the natural and the social. To design from the perspective of a terrestrial amongst other terrestrials, and seriously address the questions where to care, who cares and how to care, one needs to first acknowledge complexity and re-think one own design practice as a way to re-frame/question the systems in which we design (re)discovering how they actually inter-depend. In conclusion, we have seen that, looking carefully into the complexity of contemporary reality we can find examples of practices, and behind them of cultural approaches, countering the dominant anthropocentric mindset. In this presentation I referred to them as social innovations. So far, the discussion on social innovations has focused on the results that they have allowed, and will allow, to obtain: the opening of new practical possibilities (direct results) and the production of social values (indirect results). But we have seen that they can also be considered from another point of view. That is, they can also give ideas on what it might mean to move away from the anthropocentric approach that, until now, in Western and Westernized societies, has dominated design initiatives, and get closer to embrace a more-than-human approach. Clearly, none of the social innovations we can

refer to are perfect examples of what a more-than-human approach could and should be. Nevertheless, they can be read and discussed as steps towards this direction: practical experiences with which to feed a reflection on what it means to design recognizing that we are part of the web of life, that is, to design down to earth. Of course, the social innovation we are referring to here is a widespread activity, implemented by a plurality of actors. But, among them, there are also those who, due to their skills and abilities, are design experts. That is, the designers. Given that, what deign experts should do is to be part of these social innovations, to adopt this same approach and, as their specific contribution, to feed the processes with ideas and to support them with appropriate design tools. A way of operating which, until now, we have referred to as “design for social innovation”, but which perhaps, in the light of what has been said, could be better defined as “design in social innovation”.

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Perpetuum mobile.
Identity and value landscapes of contemporary design

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The condition in which design operates on a global level, due to the phenomena caused by the digital revolution, determines the need to recover possible margins of action especially with respect to the primary function of design, as mediator of the material and immaterial aspects of production systems with respect to to society. From this point of view, having overcome the idea of design oriented towards the exclusive consumption of the formal value of objects, design today is a planetary laboratory of thought, capable of researching and developing new ways for the inclusion of technology in human life, also alternatives to existing ones.

Digital revolution as a seismic event

The digital condition, also defined as "contemporary plankton", due to its set of fluctuating differences, determines a context, for design, in which it is not easy to identify the margins of possibility and collective meaning. We find ourselves acting in a state of continuous present, crushed by the speed of happening and the simultaneity of phenomena; design follows countless cultural, socio-technical and productive paths: that of knowledge, of hybridized knowledge, of social and cultural emergencies.

Today we can say that digital, even with not exactly positive phenomena, has been completed. Already at the end of the '90s Negroponte was announcing the end of the digital revolution, when we would have noticed the digital for its absence and not for its presence; but at that moment he did not foresee the long wave and the generative effects on the innovations that would follow. Innovations that would have also involved the sphere of bio-technological research. Today we talk about post-digital especially in reference to critical thinking, a new 'asterism' as opposed to the pervasiveness of digital, "an attitude that is more concerned with being human, that with being digital. " (Bartholl, 2015)

The need to bring man back to the center of the world's transformation processes is related to the need to design visions within which the project can assume meaning and transformative capacity in relation to emerging needs.

The digital revolution has had the effects of a seismic event, transforming the world from within and profoundly, affecting interpersonal and working relationships, the material world as well as the immaterial one; finally, the nature of things: "we are faced with a universe dominated by other 'things', not abstract and immaterial phenomena, but lumps of structured matter, solid presences called to interact not only with the body, but also with the mind, not only with the senses, but also with the thought. "(Vitta, 2015)

Digital colonizes technological systems by continually creating new species and instantly extinguishing pre-existing products, in an energetically and technologically self-powered process perfectly described by Bauman: "Perpetuum mobile: a self-sustained and self-sufficient contraption, containing everything needed to remain in continuous, ininterrupted movement, to be eternally on the move, needing no further outside boost to stay in motion-no stimulus, push or pull, no intervention of an external outside force, no input of new energy ."(Bauman, 2012)

We are in a mature phase of the digital revolution in which, from the *dematerialization of objects*, we have arrived at the *dematerialization of actions*: we open the front door and pay for what we buy with the same smartphone that performs other functions.

At the same time we are wedged in a dimension of human action *between immateriality and materiality*, in a continuous reference; as Olga Goriunova states: «there is no point in designing a system, be a data system or a house, if it cannot pratically and actively affect things, outside of its immediate materiality. "(Goriunova, 2016)

For Goriunova we produce intangible technologies to generate materiality which, in turn, will generate a new humanity and a new action.
For Byung-Chul Han: “Through this medium (digital, editor’s note) we are re-programmed, without fully understanding this radical paradigm shift. We struggle behind the digital medium which, acting under the level of conscious decision, decisively modifies our behavior, our perception, our sensitivity, our thinking, our living together. Today we are intoxicated by the digital medium, without being able to fully evaluate the consequences of such an inebriation. This blindness and simultaneous numbness represent the crisis of our day.”(Byung- Chul Han, 2015)
The blindness to which Byung-Chul Han mentions is undoubtedly due to the technological condition in which we are immersed, but also to the compression of time that characterizes contemporary action. There is also a technological determinism that gives the design a very strong and, in some ways, pervasive aesthetic matrix. A very case in point was offered by the exhibition *Out of hand. Materializing the Postdigital* (MAD, Museum of Arts and Design, 2014); all the installations and objects visible in the exhibition demonstrate a strong aesthetic and structural, as well as conceptual, link caused by digital technologies. This demonstrates the non-neutrality of the digital environment, which can draw our thoughts and actions through a predetermined architecture, a structure of meaning. As Floridi states: “ICTs are not just rebuilding our world: they are re-ontologizing it.” (Floridi, 2012)
If digital, in its resemantization of the world, has reached the skin of objects, post-digital, through its own critical dimension, brings new meanings and open, collective and intelligent design visions, capable of involving people, territories and companies, starting from listening the needs expressed.

Design as intention
Within the horizon of the scenario described, the project requires a close connection of all knowledge and a strong critical dimension to orient possible futures, to curve development paths that seem predetermined by technological trajectories.
In a universe dominated by mathematical metaphor, in which everything can be solved through a numerical container and its corresponding form, the return to the creation of value through meaning (the meaning that creates form) brings us closer to what has always characterized the various human civilizations and the system of objects that characterized them.
Putting the values you believe in at the center of the project is automatically an act of human sharing and also an intention to give a real shape and direction to the future.
The contemporary context forces us into a form of ‘continuous present’, which draws on contextual possibilities without building a divergent and intentional future.
Vilém Flusser, retracing the meaning of the word design in its various aspects, identifies it precisely with the meaning of intention: “the term design has managed to carve out a key position in everyday language because we begin (perhaps rightfully) to no longer believe that art and technique are sources of value, and to realize the intention (design) that supports them (…). The answer is precisely this: it all depends on the intention.“ (Flusser, 2003)
To respond to the need for a ‘political’ vision, in the highest possible and intentional sense of the project, the real innovation to be sought is an innovation of meanings, which requires a critical and dialogical mind and attitude capable of producing visions within which it is really possible to return to inhabit the world.
“We need to dream new dreams”, Anthony Dunne and Fiona Raby say (2013); questioning the role that design can play in the creation of a possible future, they propose design as a speculative place, producer of dialogues, debates and scenarios. With reference to the provocative and alternative charge of radical design and in the awareness of the historical impossibility of re-proposing the same contents, Dunne and Raby believe that, by proposing truly alternative projects, capable of producing discussion and dialogue, reality can become more malleable, also stimulating the search for innovation towards

horizons different from those we now regard as acquired.
“We are more interested in designing for how things could be” (Dunne & Raby, 2013): identifying design as a space of real possibility of change - beyond what the technological and factual context configures as our present and future - is a logic consequence of a speculative and critical design.
Many designers of the new generations find themselves operating in this sense, often touching the paths of art; this is because their projects refer to a conceptual and synthetic type of action. Moving away from the necessity of the function or enriching it with possibilities and new meanings, they propose a truly human centered design, in which design is more reality than reality itself, because it starts from the identification of real human needs and values.
Critically introducing into the project what is normally left out - discomfort, symbol, death, passion - returns the world of things to humanity in a profound and valued way. The radical thinking to which Dunne and Raby refer, already at the end of the 90s, reviewed the role of design in a way that is more in keeping with the needs of society.
Andrea Branzi states: “Contemporary Italian design is a phenomenon comparable to the same energy of inversion, capable of elaborating innovation as a political response to negative operational and cultural conditions. A capacity, that is, to invert or at least interrupt the path of cause and effect, whereby the aesthetic production becomes an inverse or deviant effect, with respect to the contextual causes from which it moves. Limits often become new opportunities for a different factual model. “(Branzi, 1999)
It is precisely this capacity for inversion of the generative flow of technology that can give intentionality to the project and contribute to bending the present through the capacity for criticism and imagination: “If the imaginary did not exist, one would have to invent it. And in so many ways, we have: the imaginary functions as a sort of a reality-producing device. “(Parikka, 2016)
The vision of design as a device for the production of reality would be merely reductive without starting from a speculative and critical capacity. Starting from this approach, design is increasingly configured as an experimental and open laboratory. Labs, a suffix increasingly recurrent in private or public institutions, become places to narrate technology in accessible forms, in which each object becomes the start-up of the next; design labs are also places to explore the territories of the possible with respect to social evolutions, ‘beyond’ technology.
An example of this research attitude can be referred to Anthony Dunne and Fiona Raby and to the work of Elio Caccavale, or to movements such as the Massive Change Network, promoted by Bruce Mau, aimed at proposing the development of design as a discipline capable of educating society to identify creative solutions that affect the future development of consumption.
The discourse is different for the laboratories financed by large private groups to explore technological possibilities; here the narrative of the project acts within real currents of knowledge, supported by predominant ideas.
Bishop, Gansing and Parikka, pointing out the post-digital phenomena in design and research, affirm: “Concurrent with the emergence of the digital and post-digital, as well as the solidification of neoliberal political economies, has been the rapid increase in programs and labs committed to collaborative experimentation in art and technology. The current prominence of art and technology labs in the context of the resurgence of collaborative practice involves also a wide range of cross-disciplinary groupings of designers, scientists, engineers (...) At the same time, the massive growth of the tech sector has given rise to a new generation of speculative research enterprises, from Google to SpaceX. “(Bishop, Gansing, Parikka, 2016)
It is precisely within this context that design must fit politically; design, understood in the sense of mediator of the material and immaterial aspects of production systems that are no longer autonomous, satellites within contemporary industrial dynamics, can favor shared processes of value creation.
Having abandoned the idea of design oriented towards the exclusive consumption of

the formal value of objects, design today is a planetary laboratory of thought, capable of researching and developing new ways for the inclusion of technology in human life, even alternatives to existing ones.

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BAL 22

CONTRIBUTIONS

01 Survey and Representation as system of monitoring and action on the risk factors and conditions of the context

Digital images for the knowledge of bell towers and their ornamental signs

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Abstract

The focus of the paper is the study of interwoven ornamental motifs found on complex architectures, such as bell towers. Specifically, it is highlight the mode of investigation performed through the use of UAVs. These tools are indispensable for an accurate knowledge of this architectural typology, which is characterized by a considerable height compared to the planimetric system. This is demonstrated in the digital survey of the bell tower of the Cathedral of Caserta Vecchia. The representations resulting from the flights allowed to carry out a stylistic and geometrical comparison of the ornamental elements, derived from Islamic and Byzantine contaminations, between this and the bell towers of Amalfi and Gaeta Cathedral. In particular, a geometric analysis of the systems of the tambour and of the intertwined arches has been carried out, action that provides a knowledge base for future strategies of valorization of the heritage, as well as for their cultural diffusion.

Keywords

Bell-tower, UAVs sistems, rappresentation, ornamental drawing, geometries.

1. Introduction [OZ]

Object of study of the paper is the geometric-configurative analysis of the ornamental motifs that characterize the bell towers, complex architectures often inaccessible, aimed at the knowledge of tangible and intangible heritage for future valorization strategies, dissemination and cultural enhancement. In particular, the methodology used involved a stylistic and geometric comparison between the ornamental elements that characterize the top of the bell towers, choosing some case studies deriving from Islamic and Byzantine contaminations. This historical period well expresses the theme of decoration on flat or curved surfaces and, at the same time, also that of interweaving. Specifically, the ornamental motifs examined were those that characterize the bell towers of the Cathedrals of Amalfi (SA), Gaeta (LT) and Caserta Vecchia (CE). It was then carried out a geometric analysis of the spatial configuration of the tops of the bell towers (planimetric and altimetric articulation) and the ornamental motifs of the intertwined arches in the cases of Amalfi and Gaeta (previously documented) with that of Caserta Vecchia, detected here through the use of UAVs.

2. UAV systems and digital photogrammetry for the representation of ornamental motifs [RI]

Historical architectures are real manifestos of the identity of the territory to which they belong and as such every action aimed at their knowledge must be carried out in full respect of the formal and material aspects of them. Therefore, also the operations for the documentation and the representation of the external surfaces and of the ornamental elements, present on them, must be carried out through procedures that foresee the use of non-invasive techniques and instrumentation. Indeed, the latter are

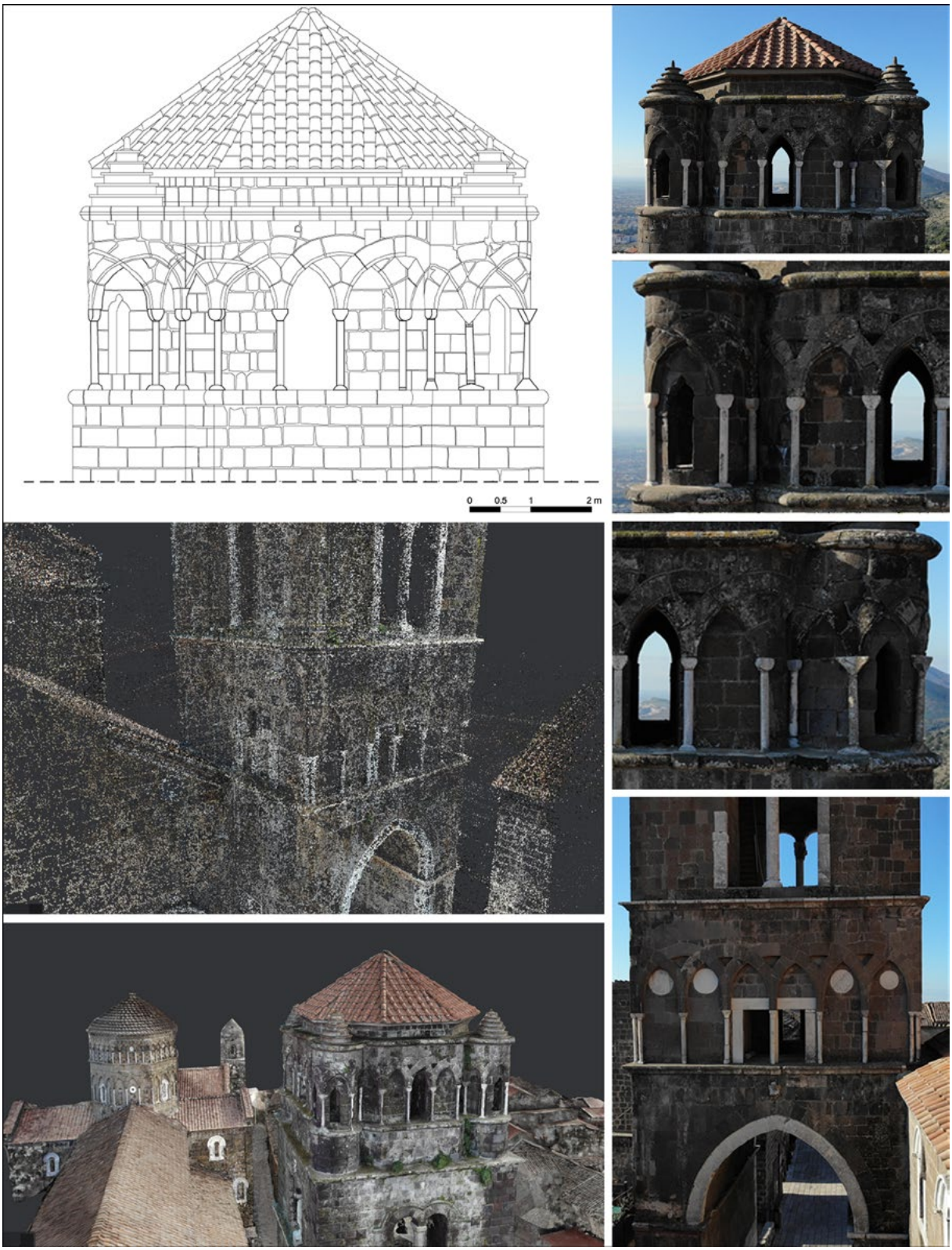

Fig. 1. Cathedral of S. Michele Arcangelo in Caserta Vecchia. Left, from top to bottom: geometric elevation of the east front; point cloud; textured polygonal model. Right: aerial photographs from UAVs (UAV acquisitions and elaborations by Rosina Iaderosa).

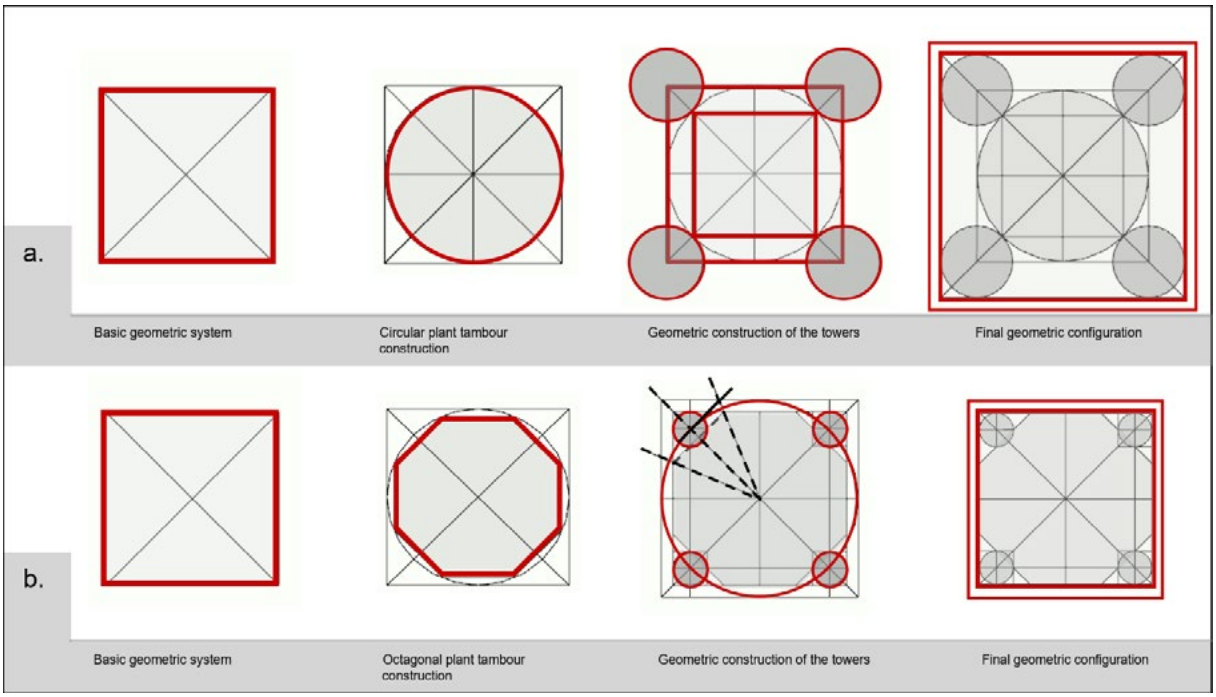

Fig 2. Geometrical genesis of the construction of the tambour and attached corner towers: a) Amalfi bell tower; b) Gaeta and Caserta Vecchia bell towers (conceptual diagrams by Margherita Cicala).

From a morphological point of view, Amalfi's bell tower has a square base, with the circular bases of the tambour and the four corner turrets. The centers of the latter fall within the square respectively at the meeting point of the two diagonals and along them. Similar, but closer in geometric composition to the Caserta bell tower, is that of Gaeta. In fact, although set on a square plan, it is governed by an octagonal tambour with four circular turrets at the corners, all inscribed in the square base. These turrets cut sharply across the four sides of the octagon, while their centres are figuratively connected in a circle inscribed in the square, the radius of which corresponds to half the side of the square. This planimetric composition is similar to that of the bell tower of Caserta Vecchia. On the other hand, there is a clear difference in elevation. The tambour of Gaeta's bell tower is very high in relation to the height of its turrets, creating a strong visual gap between the two architectural elements; in contrast, the tambour of Caserta Vecchia's bell tower does not present this significant variation in height, which creates visual continuity. [Fig. 2].
Regarding the configurative genesis of the ornamental motives that dominate this portion of the bell towers, the geometric movements produce a visual fluidity of the arabesque ornamental elements, but in a different way, both geometrically and perceptually. The ornamental motif of the Amalfi's bell tower is governed by the translation of eight pointed arches that, rotating around the cylinder, overlap each other creating an articulated interweaving, while in the corner turrets the same criterion is used again with round arches. (Zerlenga, 2006). This principle accentuates the perception of the circular movement along the cylinder, emphasising the visual separation between the acute arches and those of the turrets. In Gaeta too, the theory of interlaced arches dominates the fronts of the bell tower and, because of the construction layout, there is no ornamental continuity with the arches of the corner turrets as there is in the bell tower of Caserta Vecchia. In this case, respecting the translatory symmetry, the interlacing motif of the arches determines a lively dynamism along the fronts of the octagonal top of the bell tower despite the intersection with the corner turrets. In this sense, differently from the bell tower of Caserta Vecchia, in those of Amalfi and Gaeta the ornamental motifs of the corner turrets (and the turrets themselves) appear more autonomous than the top decoration of the cylinders, generating greater spatial and visual vivacity [Fig. 3].

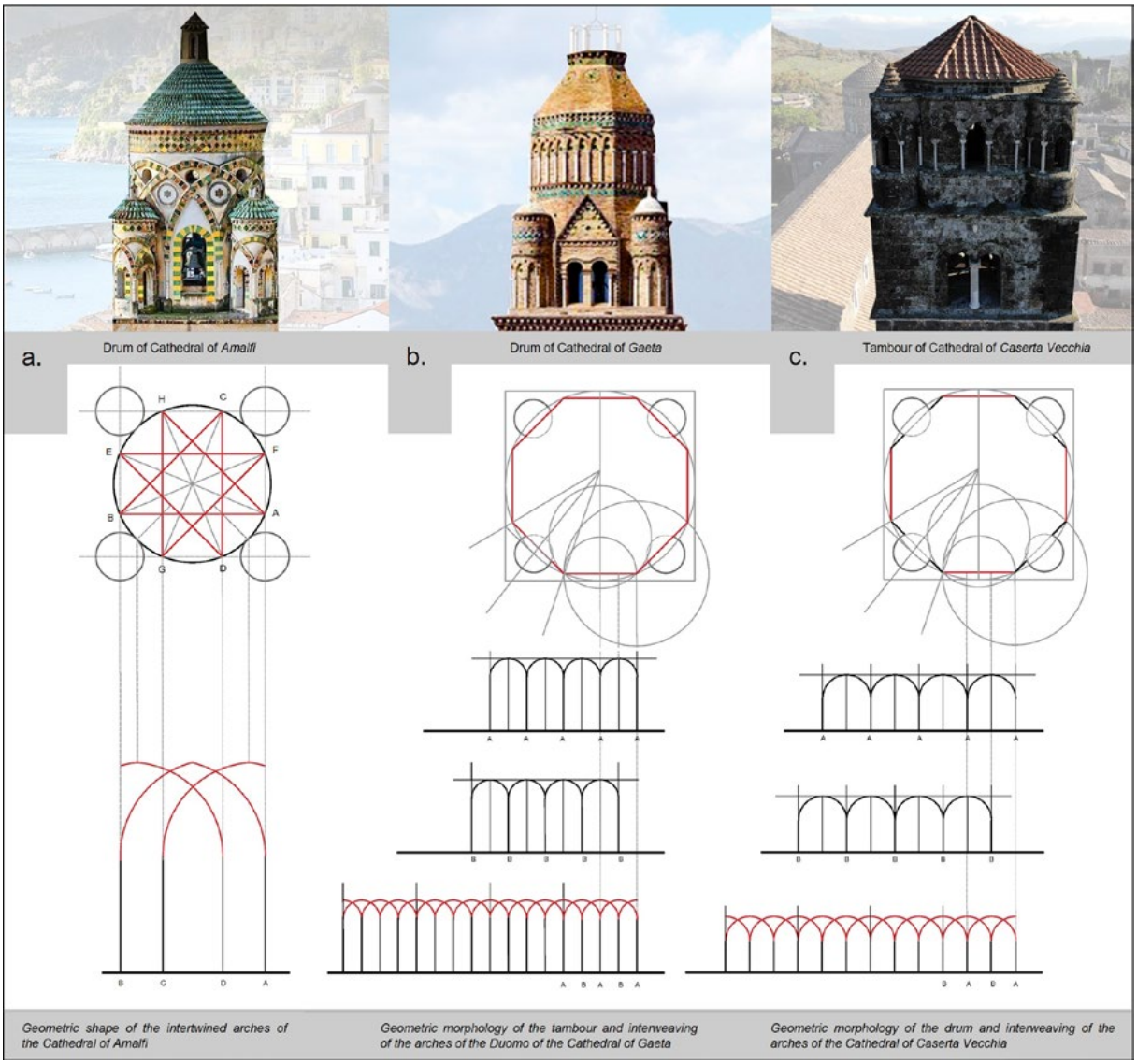

Fig 3. Geometrical-configurative analysis of the drawing of the movement of the interlaced arches and annexed analysis for the planimetrical systems respectively for the bell tower of the Cathedral of Amalfi (a.), Gaeta (b.) and Caserta Vecchia (c.); (elaborations by Margherita Cicala).

8. Conclusion [OZ]

The requirement to get architectural surveys to know the ornamental apparatus of complicated and inaccessible architecture, such as the bell tower of the Cathedral of Caserta Vecchia, was approached here using UAVs. At present, these remote acquisition tools are indispensable in order to obtain an accurate knowledge of these types of architecture, which are characterised by their high elevation in relation to the planimetric system, often making it difficult (if not impossible in the lack of external scaffolding) to carry out an architectural survey using only direct methods. In this context, the digital survey of the bell tower of the Cathedral of Caserta Vecchia, performed by means of UAVs and the subsequent processing phases, has permitted both an understanding of the configurative genesis of a complex ornamental motive such as that of the interweaving (facilitating the acquisition of data), and the restitution to the community of a 'geometric concept' underlying the construction of these decorative apparatuses, as shown by the comparison made here by analogy and difference between the

ornamental geometries of the bell towers of Amalfi and Gaeta and those of the coeval bell tower of Caserta Vecchia.

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Naples, Leopardi, and the Artist/Inhabitant Project. Practices of aesthetic resistance

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Abstract

The contribution describes the process and the outcomes of a workshop that the authors conducted with the students of DADI, attending the second year of the Master of Science in Design for Innovation, during the Branding Innovation course; the workshop was one of the activities with which the Department of Architecture and Industrial Design participated at the project Artista Abitante. Project conceived and promoted by Eugenio Giliberti, together with Museo Madre, Fondazione Morra, Dafna Gallery and Intragallery. In collaboration with: the Municipality of Naples; the National Center of Leopardi Studies of Recanati; the National Library of Naples; the Academy of Fine Arts of Naples, the DIARC, Department of Architecture of the Federico II University and with the patronage of the University l'Orientale of Naples and the support of the Association of Builders and the Association Friends of Naples. The project,starting from an episode of public art linked to the figure of Giacomo Leopardi, aims to trigger a virtuous process of urban regeneration in the context of the historic centre of Naples.

Keywords

Urban regeneration, social innovation, collective consciousness, visual communication

1. Cultivating imaginaries. Between urban regeneration and creative city [AC]

The themes of urban regeneration, social innovation, redefinition of the role of the public, and democratic participation in the creation of value, are interconnected and work together to define the concept of 'patrimonial community' so well outlined by the Faro Convention when it explicitly refers to the right of everyone, alone or collectively, "to benefit from cultural heritage and to contribute to its enrichment" (art. 4). In a broad sense, these are themes through which it's possible to identify more or less complex design paths, but all aimed at encouraging new forms of management of urban space by relocating it in a new system of values.

Re-reading the research and publications on the theme of valorization in recent years, it is possible to see, however, how some cities have focused their attention on becoming places of cultural consumption. On the contrary, other cities have preferred to try to be recognized as cities of cultural production, by supporting local cultural and creative industries, promoting production districts and trying to distinguish themselves for their own specificities.

This is the most interesting horizon of urban regeneration processes, this is the frame in which it is possible to enclose a large number of actions, experiments, imaginative practices and reinterpretations of the common models for the use of urban space, in which the concept of creativity has often been used with an increasingly broader meaning to the point of being considered one of the most important resources that cities have available to bring new life to entire neighborhoods, through strategies of reappropriation or rethinking of their cultural identity.

In the context of such interventions some places can represent real activators of collective consciousness and become an active part of an urban ecosystem, aimed at stimulating contamination between different sectors of the economy and the social and urban sphere. These are places that have

the ability to intercept networks of active relationships and to become containers of projects that civil society is able to express through organized and stable actions.
In this context, the theme of public art and its role in the activation of regenerative processes has assumed a certain relevance over time. Having cleared the field from the rhetoric according to which, even in the absence of effective policies to improve the urban condition and living, it is possible to support a process of transformation with only the beauty of a work of art or with the involvement of local actors through public art, the potential of such interventions should be emphasized. It is not so much a question of placing works of art in spaces not designated for art, but rather of building narratives around objects with an artistic vocation that can convey shared values.
With this spirit, the Neapolitan artist Eugenio Giliberti, has been tenaciously pursuing the idea of promoting and redeveloping the places that housed the last Neapolitan residence of Giacomo Leopardi, through a series of actions, which, starting from the sediment of memories of the inhabiting community, are aimed at creating a circuit of Leopardi, as a premise of a future project of urban regeneration. The area involved in the project is one of the most dense of history in the city of Naples. Its fulcrum is the modest building at number 2 in Vico Pero, whose main facade overlooks the crowded via Santa Teresa degli Scalzi. Leopardi lived there from 1835 to 1837 and died there on June 14, 1837. The strange shred of the city – residue of the violent wound inflicted, a few years before the arrival of Leopardi, by the opening of Via Nova, (the current Santa Teresa) and consisting of the triangle of vico Pero, Vico Noce and Vico Cimitile – still retains an almost unconscious memory of that presence, still hears the echo of the stories and gossip bounced from one balcony to another, on that small court made up of Giacomo, his inseparable friend Ranieri, his sister Paolina and the cook Pasquale Ignarra.
It is a piece of city characterized by a palpable dimension of enclave, almost a small village cut off from the pressing rhythm of the adjacent city, a Vicolo Paese to use the convincing neologism with which Giliberto has defined it. The idea of the artist, artist/inhabitant as he defines himself, is to turn on a spotlight on this reality, almost completely unknown to the rest of the city, through an installation of wall painting on the main facade of the building that overlooks Via Santa Teresa degli Scalzi; an episode of 'poetic reaction' that functions as a trigger for a process of re-appropriation of identity and memory. The project saw its first exciting rehearsal on the evening of June 15, 2021, when on the wall of the building appeared the projection of an intense page from I Nuovi Credenti. Judging by the intense emotion provoked in whoever happened to pass by that evening, unaware protagonist of a real urban performance, the idea of the project is a winner!
However, it should not be read in its episodic dimension, but in its ability to create a potential trigger of other actions that we could define as practices of aesthetic resistance. The involvement of the DADI research group – called to collaborate in the project by imagining strategies of valorization, in the field of communication design – goes precisely in this direction.

2. From details to fragments [CCF]

Historical The workshop outcome (fig. 01, fig. 02) is made by visual communication projects, aimed at recalling and spreading the presence of Giacomo Leopradi in Naples and in the Vesuvian area. Each project shows a defined linguistic choice and has a specific degree of interaction with the final users. For each project the linguistic choices as the choice of the points of view – or, better, of the reference systems and the interpretative categories – are the result of a design methodology shared by all workshop participants. In the workshop we called this methodology from details to fragments.
A synthetic denomination to define the articulated passage from the already known identity of an urban space – identity historically defined, diffused, shared and well rooted in respect to the relations of a physical and cultural context – to a new identity of the same place, when it is defined through an interpretative process that chooses a reference system in which the place is inserted together with others (selected according to a common factor) and, therefore, reinterpreted with a new reading key, organic to the new reference system and, above all, consistent with the inclusion of new materials for comparison and analysis.
The denomination derives from a text by Omar Calabrese (1986) – Detail or Fragment: two strategies of textual analysis – in which the author writes:The structure of each extended abstract includes the following sequence of elements:

Fig. 1. The workshop's outcomes are capable of activate participatory processes; each project has identified solutions of proximity between places and targets; they range from the intimacy of kitchens to the shared dimension of the network, passing through the rooms of *Villa delle Ginestre* and the streets of *Vicolo Paese*

> *The practice based on the examination of phenomena in detail is an analytical practice of a deductive or hypothetical deductive kind. The detail, in fact, is thought of as a portion of a whole that allows, through a close examination, to [...] reread the global system from which it has been [...] provisionally extracted [...]. Instead, the practice based on the examination of phenomena as fragments is an analytical practice of an inductive or abductive type. The fragment is generally a present portion that must refer to an absent system.*

In the case of this workshop, the strategy of detail allowed the workshop participants to highlight – through the examination of historical and current cartography, as through the analysis of urban and architectural transformations – the exceptionality and, therefore, the specific and peculiar characteristics of every urban part interested by Leopardi's presence; while the strategy of the fragment has allowed to reassign to the same places a new communicative role or, in the specific intentions of the workshop, a new mnestic role.

The project interpretations resulting from the workshop have intercepted itineraries and connections that are exuberant respect to what was required by the terms of the original project (Artista Abitante), but that are consistent with the phases of analysis dedicated to the research on Leopardi's presence in Naples. For this way, the very first place – that in the original project is named Vicolo Paese – has been replaced by an articulation of places that widens the physical field of investigation to the dimension of

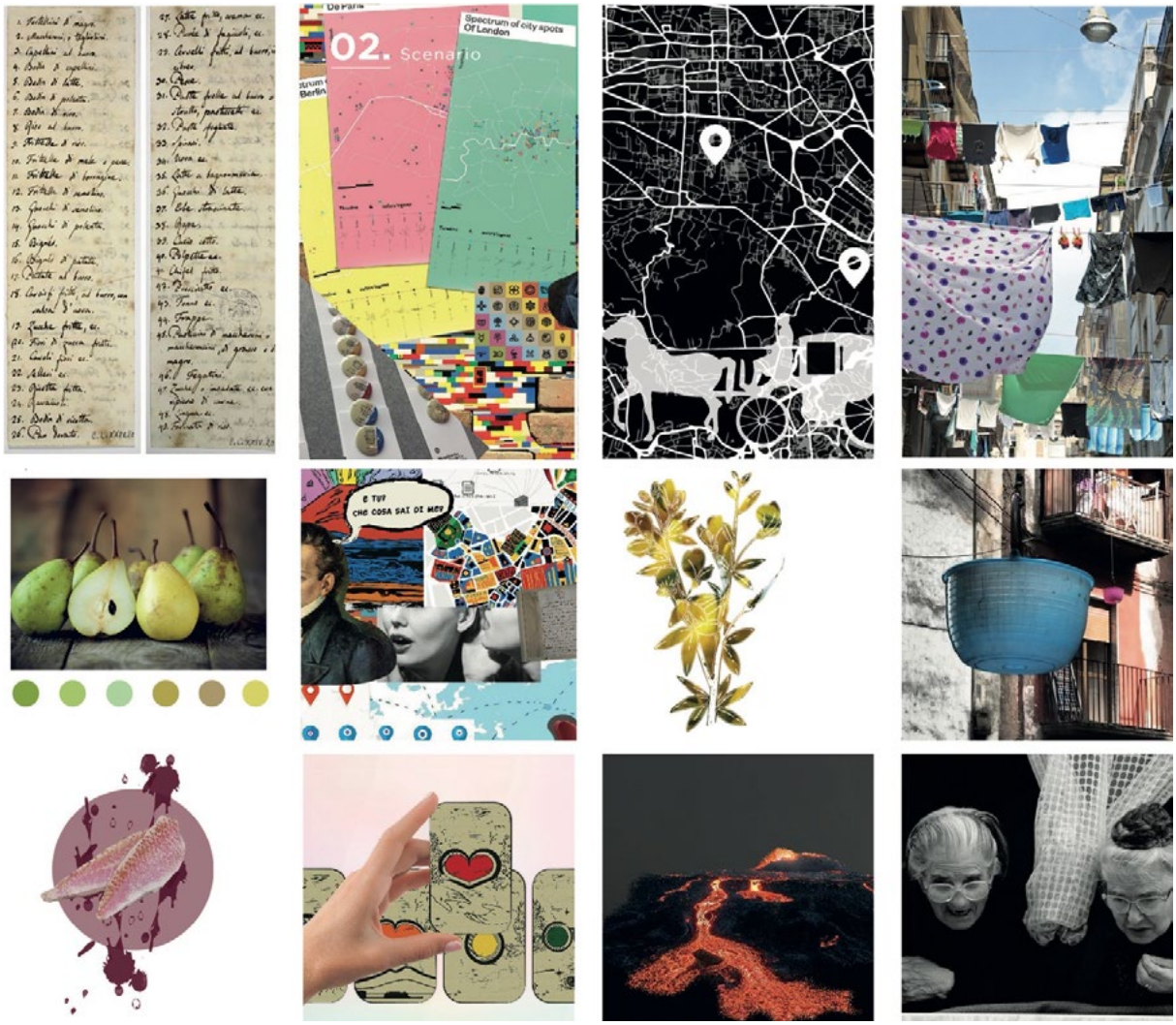

Fig. 2. Each project evokes Leopardi's memory with its own modality of interaction, articulated through the sense of taste, the construction of an online observatory, the immersive experience, or the performance.
Le 49 pietanze di Leopardi, by A. Mautone; Wikipardi, by A. Farina, L. Gervasio, F. Manfredi, A. Rosmino; Giacomo. *L'uomo oltre il poeta*, by M. Cirella, A. Giuliano; 57, by N. Buonpane, S. Coscione.)

the Quartiere Stella and to all the paths marked by Leopardi's traces in the city of Naples and in the Vesuvian area. Moreover, the street and the three alleys have been replaced by itineraries and routes; the facade of Leopardi's building, in via Santa Teresa, has been replaced by the urban curtains of Leopardi's routes and stops; the house where Leopardi lived until his death has been replaced by the various dwellings where Leopardi lived in Naples and Torre del Greco. This tangible context, so enlarged to evoke Leopardi's presence in town, is the first exit of the workshop analysis; the further step of the workshop has been the investigation of the connection between this articulation of urban spaces and Leopardi's words, with the aim to identify interpretative categories and to configure new reference systems so that the details could become fragments, still tangible, of an immaterial relational system in which the generic memory of Leopardi gave way, acquiring a more intense definition, to different and specific kinds of memories and new experiences. In fact, through texts – travel contracts, rental agreements, writings, epistles, poetries or food lists – every team of the workshop have defined its reference system with the consequence that Leopardi's presence has been evoked through flavors and tastes; steps, passages or stops; nicknames; gossip; recurrences and references; sounds and scents;

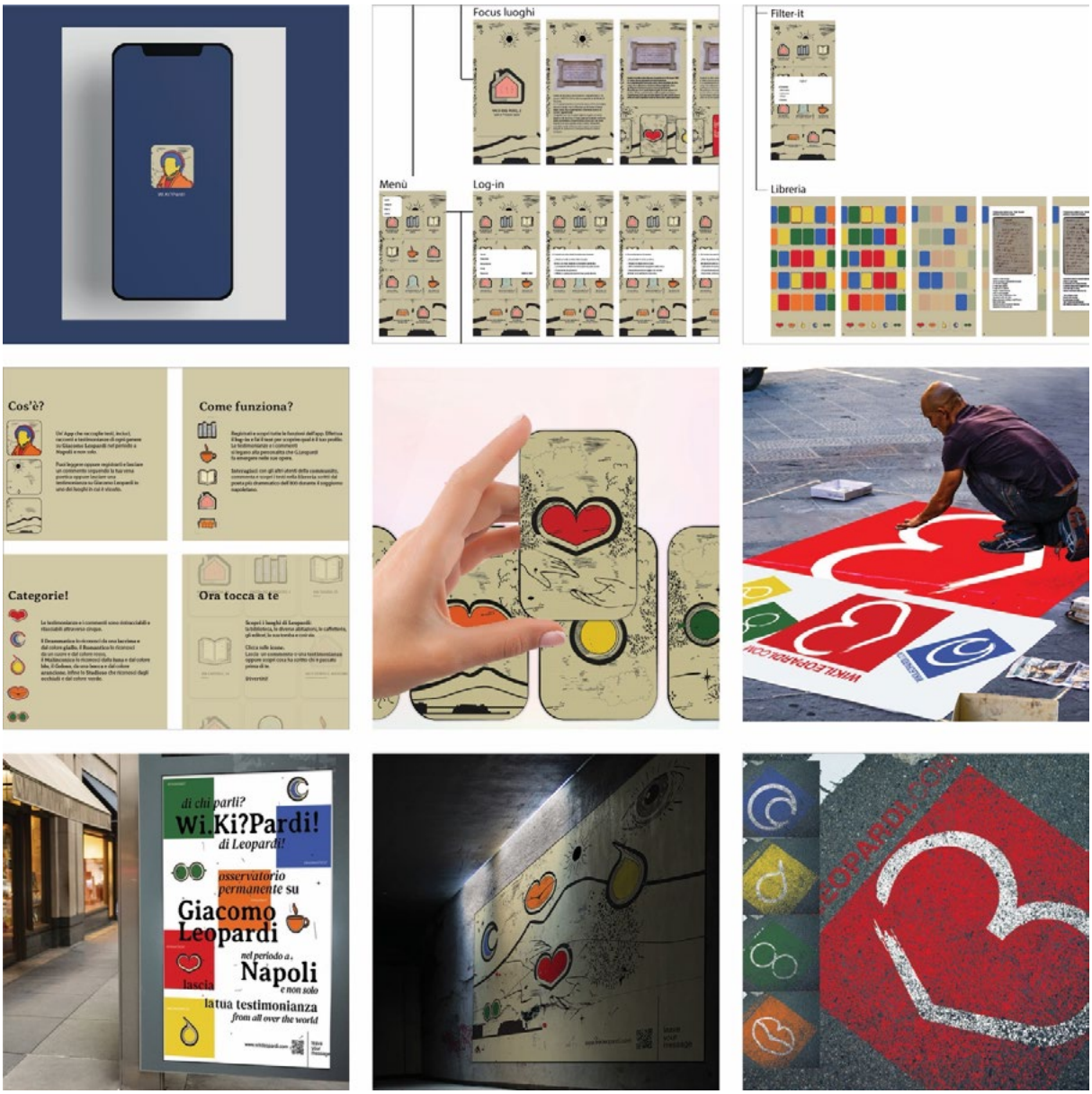

Fig. 3. *Wikipardi* by Alessia Farina, Livia Gervasio, Federica Manfredi, Antonella Rosmino. The smartphone application stimulates the development of a collective knowledge of the personality of the poet Giacomo Leopardi and his relationship with the Campania region. In addition to the digital product, a series of communicative artefacts have also been designed to collect more and more users.

lights and glows; doubts and superstition; pleasures and frustrations; denouncement and reluctance; desire and suspect. The degree of participation and interaction of the users has oriented the choice of languages and types of communicative artifacts: maps; printed editorial products; digital products; sound and visual devices; manuals; posters; stickers; horizontal and vertical signs; environmental, re-editable or site-specific installations; happenings.

In conclusion, the outcomes of the workshop – if seen as a whole and, therefore, as projects that make up a unicum of integrated actions – are individual parts of a narrative atlas that collects solutions and suggestions suitable to activate curiosity, as to support knowledge stratification. An atlas that contains and shows a mnestic landscape, in which new languages are experimented for the activation of new

and visual devices; manuals; posters; stickers; horizontal and vertical signs; environmental, re-editable or site-specific installations; happenings.
In conclusion, the outcomes of the workshop – if seen as a whole and, therefore, as projects that make up a unicum of integrated actions – are individual parts of a narrative atlas that collects solutions and suggestions suitable to activate curiosity, as to support knowledge stratification. An atlas that contains and shows a mnestic landscape, in which new languages are experimented for the activation of new processes and in which the interaction between the user and the fragments makes Leopardi's presence contemporary, excluding any contemplative option. In this sense, the atlas is a device that tends to transform urban spaces, once frequented by Leopardi, into an environment, into a set of conditions and relations designed to experience certainties and ambiguities of Leopardi's memory in Naples and on the slopes of Vesuvius.

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Representation of territorial identities of Panagia Paraportiani in Mykonos

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Abstract

The research presents the results of the architectural survey campaigns and the subsequent graphic representation and modelling of the church complex of Panagia Paraportiani, built in the 15th century AD in southern Greece. The scarce graphic and iconographic documentation of the religious architecture required the implementation of a methodology for the survey of the ruins of the adjacent walls of the medieval castle of Mykonos and of the religious complex itself, consisting of five chapels. The process of methodological analysis implemented, based on the surveys carried out on site, concerned the three-dimensional representation of both the shape of the architecture and the forms of interpretation, from the photographic image taken by drone and the subsequent processing in point clouds using the photogrammetric technique to digital reconstructions.

Keywords

Survey, Photogrammetry, Digitalisation, Knowledge, Greece.

1. Introduction

The research presents the results of the architectural survey campaigns and the subsequent graphic representation and modelling of the church complex of Panagia Paraportiani, located on the coast of the Aegean Sea in Mykonos, a Greek island of the Cyclades archipelago. Classified as a national monument, it is considered a perfect example of local architecture. Its asymmetrical shape is due to the geometric conformation given by the union of five churches built over the centuries. This architecture is characterised by changing cultural and social needs that have led to a series of transformations over the centuries, which have contributed to the current conformation. In order to proceed with the narration of the places under research, the geometric structural composition of the places is highlighted. In the centre is the church of Agios Efstathios, surrounded by the churches of Agia Anastasia, Agios Sozon and Agios Anargyros, which was the first to be built at the end of the 14th century, and with the Church of the Virgin Mary rising at the top topped by a dome (Dipasquale, Montoni, Manzi, Mecca, 2020). The building complex is an architectural transformation that took place over time, considered to be an extension of the central rectangular tower of the medieval castle of Mykonos, and represented the gateway to the rocky coast, the clearly identifiable remains of which surround the religious architecture. From the 14th century onwards, the Greek Orthodox began to build religious sites near fortified places and rocky mountains. The decision to use this territory for building places of worship was justified by the historical event of the Turkish invasion of the Balkans from 1430 onwards. This event had serious consequences for Christian culture, so much so that people were forced to build defensive walls around monasteries or move to geographically safer territories. In this context, it is of considerable interest to investigate their strategic position and architectural peculiarities. The research activities relating to the current state of the sites were carried out by means of instrumental surveys (Amoruso, Apollonio, Remondino, 2010) carried out with a four-helix drone and digitising the results with two- and three-dimensional images capable of perceiving the spaces and geometries of the structures in the

Fig. 1. Aerial view of the religious complex with UAV instrumentation (Gennaro Pio Lento, 2021)

dimensional images capable of perceiving the spaces and geometries of the structures in the surrounding landscape. Therefore, It turns out to be a fundamental element for the communication of the architectural artefact examined, through which it is possible to define in parallel the final graphic rendering compatible with the purpose of the survey activity. To this end, the theme of digital modelling (Apollonio, 2012) is of great importance, since it allows the dynamics of drawing relative to both traditional and innovative digital representation to be addressed, according to disciplinary assumptions such as technical-instrumental and theoretical-applicative.

2. The methodological process

The choice of the methodological approach to adopt was determined by the twofold need to document the surrounding churches and ruins, for which there is no graphic representation, and to develop digital archives that could collect data from neglected and inadequately valued sites (Bixio, 2008). The choice of the type of survey to be carried out was determined by the analysis of several factors: the survey site, characterised by points that cannot be physically reached due to the conformation of the coastal area with rocks and the sea; the influx of tourists, which influenced the measurement phase. It was therefore decided to carry out a survey based on the combined use of traditional manual tools and innovative digital tools, in order to acquire as much information as possible in the shortest possible time. On site, a survey was chosen using a SAPR (Barba, Dell'Amico, Limongiello, Parinello, 2020) system with a quadriplegic drone, through which, with digital software processing, it is possible to obtain high-density point clouds, responding to the documentary aspects and needs of the cultural heritage, using low-cost instruments towards the area of fast and reliable survey. Following the acquisition of high resolution images (Bertocci, Parrinello, 2015) obtained from preliminary flight planning, in order to obtain a complete restitution of the area analysed, it is possible to proceed with the photogrammetric process. This technique is developed using software that allows the acquisition and management of accurate and georeferenced three-dimensional data with the generation of point clouds. Its workflow is based on four phases: Align Photos, Build Dense Cloud, Build Mesh e Build Texture. First, an algorithm evaluates the camera's internal parameters (focal length, radial and tangential distortions), the camera positions for each shot and the dense cloud. In the next step, more pixels are reprojected for each aligned camera,

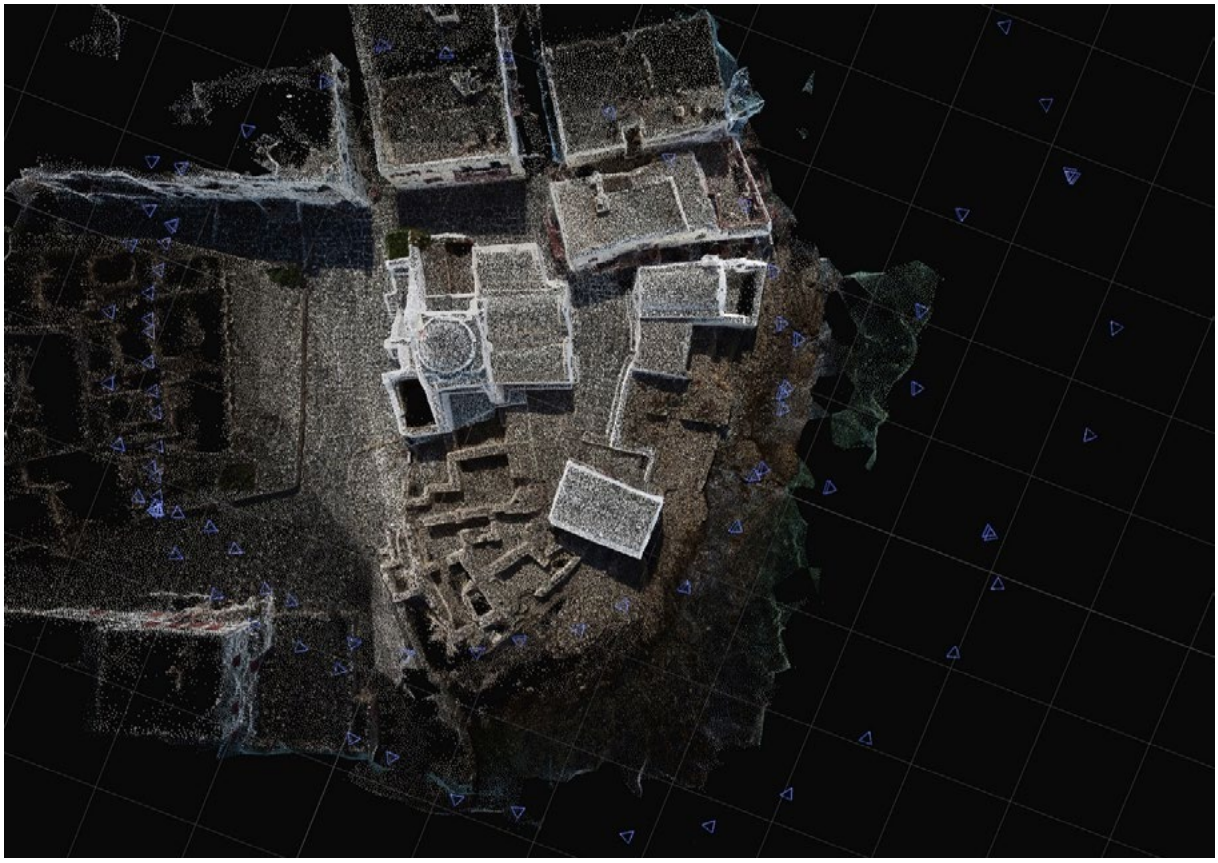

Fig. 2. Top view of the point cloud obtained through the aerial photogrammetry process with the identification of shooting points (Gennaro Pio Lento, 2021).

creating the Dense Cloud. In the Build Mesh phase, a polygonal mesh model is generated based on the dense cloud data. Finally, the polygonal model is textured in the Build Texture stage. The final methodological phase is characterised by a processing of the collected data allowing the generation of graphic and digital products, represented respectively with two-dimensional drawings and three-dimensional modelling, acquiring a series of information, from metric to material and geometric-compositional, representing an important knowledge tool.

3. The survey and modelling phases

In order to document and valorise the anthropised cultural heritage, the new information technologies applied to geometry become a necessary tool for the analysis, restitution and detailed information of the architectures analysed through which it is possible to define the final graphic rendering compatible with the purpose of the survey activity, indicative for the protection and valorisation of the asset. The digital representation, as well as the realisation of models, in addition to covering a graphic role of three-dimensional reproduction of the object, is the tool for verifying the congruence of conventional representations, such as two-dimensional graphic drawings with respect to virtual graphics (Corniello, 2020). Digital modelling is of great importance, as it enables the dynamics of drawing related to innovative digital representation to be tackled in accordance with technical-instrumental and theoretical-application assumptions, the practice oriented towards modelling the object as a form, it covers the main critical and theoretical exercise of method for digital technologies by defining the issues of a geometric nature necessary for the creation of virtual models. These models, appropriately processed and rendered with the use of specific software, aim to represent the cultural heritage starting from digital

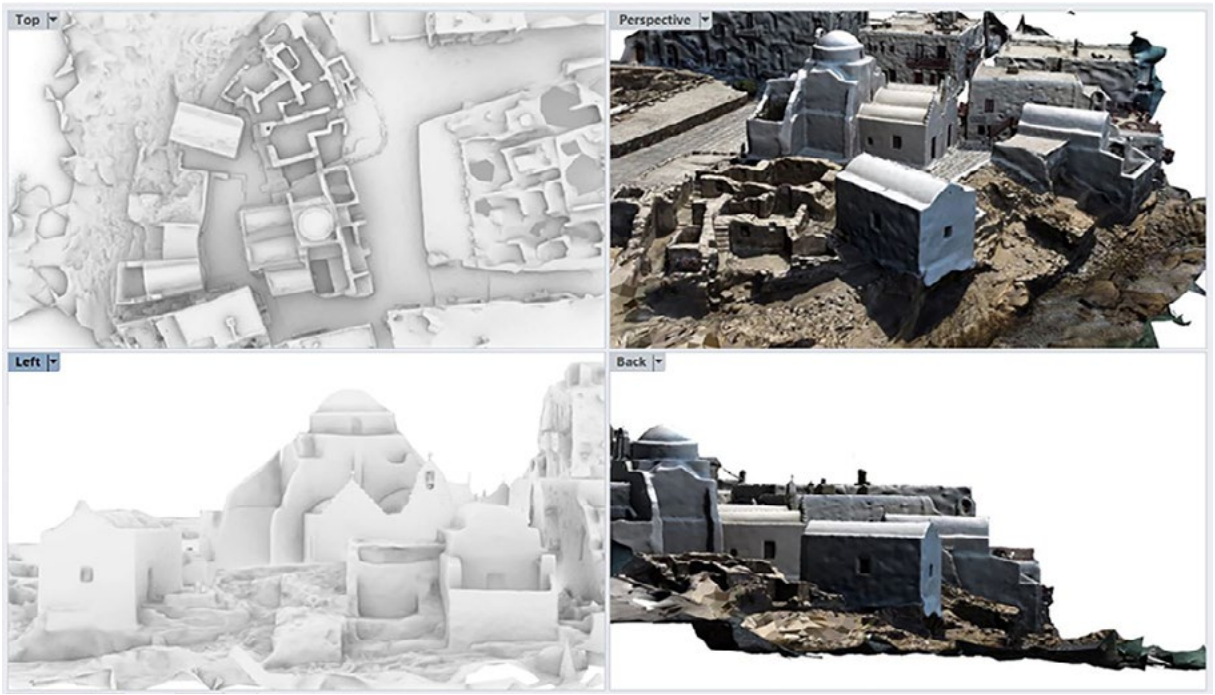

Fig. 3. Textured three-dimensional model obtained with the integration of digital software (Gennaro Pio Lento, 2021).

images at different scales and from acquisitions with low-cost instruments, in addition to the availability of new technologies for processing, managing and displaying 3D data (Giandebiaggi, Zerbi, 2015). In order to obtain a three-dimensional model of high quality and which is congruent with reality, there has been an attempt to aim for a standardisation of certain acquisition and production processes, following the survey phases, comprising a series of independent and generally shared steps. This framework, which has matured over the last few years, has resulted in: the use of consolidated three-dimensional modelling techniques; significantly faster digital production processes; and higher quality, accuracy and fidelity of cultural heritage reconstructions.

4. Conclusion

The research presents a methodological approach that starts from the consolidated techniques in the discipline of representation by employing techniques based on the combination of photogrammetry, modelling and digital visualization (Manfredini, Remondino, 2010). These techniques are indispensable for documenting and enhancing Cycladic architecture, aimed at interpreting the territorial and architectural transformations of the churches that make up the religious complex analysed over the centuries. Through the proposed studies, it was possible to observe the resilience of these places as a result of changing social and cultural needs (Salerno R, 2017). In order to analyse these places of worship, the architectural survey and the subsequent graphic processing of the data acquired were of fundamental importance (Remondino, 2011). Through survey techniques such as the use of drones and digital photogrammetry, it was possible to represent, through a knowledge drawing, not only the geometric aspect of the architectural artefacts but also the landscape context. This method of knowledge also made it possible to identify the critical points of these places, such as their geographical position, being fortified places on rocky coasts. The proposed works are therefore proposed as innovative processes of documentation, management and use of knowledge through tools to be used as models for the elaboration of digital archives with a high level of description and detail of the architectural and natural heritage, in order to ensure their enhancement and conservation over time.

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Digital narratives for cultural heritage: new perspectives for accessibility and inclusion

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Abstract

The themes proposed by the New European Bahaus include, beyond the essential issue of sustainability, also social topics related to accessibility and inclusion. These two aspects fall within the sphere of common living and communication of cultural heritage, approaching strategies of "extended use" aimed at overcoming physical and cultural limitations, in favour of actions of valorisation and knowledge of the assets, accessible to everyone. In this sense, the experiential dimension offered by future installations, performances and tours, must guarantee an independent experience for each person, regardless of age, cultural background, physical, sensory or cognitive abilities. One of the possible areas of implementation of these principles, proposed in this paper, is that of digital projections, flanked by audio and haptics devices or gesture recognition systems, which define new scenarios for the use of cultural heritage, through forms of communication, promotion and enhancement, between narration and creativity.

Keywords

Digital narratives, accessibility, visual perception, virtual experience, New European Bahaus.

1. Introduction

The New European Bauhaus is a project born with many ambitious goals, including rethinking contemporary lifestyles and pointing out possible strategies to live the future in an inclusive and sustainable way, facing the wide-ranging challenges of today (Totaro, 2021). In addition to the understandable aspects linked to the green economy, the use of ecological resources and the production of environmentally friendly materials, there is a field of action linked to cultural heritage and its enhancement, which is increasingly important to develop from the point of view of inclusion, understood in a broader sense. In fact, among the key points of the New European Bauhaus project, there are: physical and cultural accessibility, aimed at involving all categories of users; inclusion, understood as valuing diversity, the uniqueness of each person and the equality of all; and obviously sustainability, reaffirming the now indispensable ecological approach to production and consumption.
These three core values have been accompanied by principles that are particularly indicative for the areas of design and communication, namely participation, transdisciplinary and the need to combine the global and local dimensions.
One of the possible areas of implementation of these principles is that of digital communication (for example, through video-projections, audio and haptics devices or gesture recognition systems) that define new scenarios for the use of cultural heritage, through forms of communication, promotion and enhancement, between narration and creativity. Opening a reflection on issues related to the digital mediation to rethink cultural, social and educational practices requires addressing, in parallel, questions about techniques, media and forms of visual culture (Pinotti, A., & Somaini, A., 2016). The approach proposed in this paper aims to show how what we might define as "digital narratives" offer themselves as useful tools for the strategies of accessibility and use of cultural heritage, defining wide-ranging inclusive conditions [fig. 1].

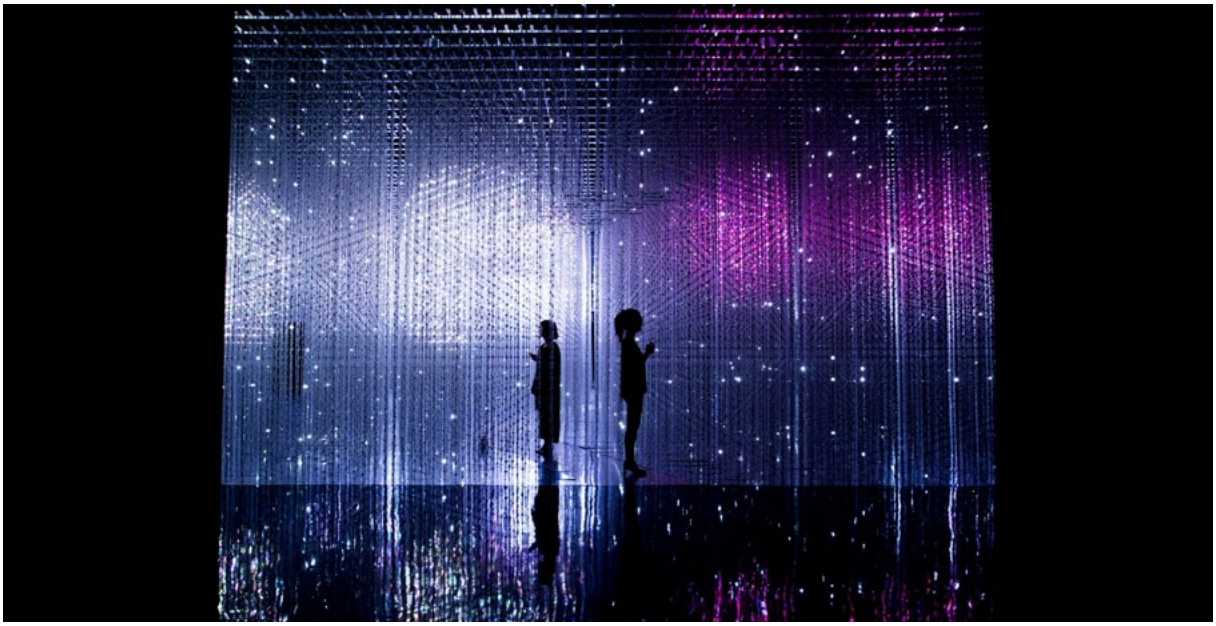

Fig. 1. *"Crystal Universe"* is an interactive installation of light expresses the universe through accumulated light points. Each artistic space activates the senses of sight, touch, hearing and even smell, as each room is designed with its own distinct fragrance (© TeamLab, 2015).

2. Concepts of Accessibility and Inclusion

One of the fundamental objectives expressed by the New European Bauhaus is to improve our daily lives by focusing on better living in beautiful, sustainable, accessible and inclusive places. On these last two aspects, architects and designers are called upon to rethink the use of cultural heritage and investigate possible scenarios consistent with these values.
The first concept we can reflect on is that of accessibility, defined as the measure to which an environment or service can be enjoyed by people without physical or cultural limitations, and for this second aspect, communication and language are the first and most important form of accessibility (Miglietta, 2020). While we could say that inclusion "expresses the attitude of an environment to guarantee to each person, regardless of age, gender, cultural background, physical, sensory or cognitive abilities an independent experience" (Laurìa, 2014) thus trying to overcome the possible limits of technological resources that could exclude from fruition some categories of users, less inclined to the use of certain devices and technological viewers. The objective of inclusion is therefore manifested as collective participation without preclusion of age, language or culture.
Accessibility and inclusion are concepts that often merge; for example, another aspect, more common but not secondary, is linked to the physical characteristics of the places and therefore, creating conditions of accessibility, translates into an operation aimed at removing some spaces from their state of places not usable for specific categories of people, such as the disabled or those with motor difficulties. Overcoming physical obstacles therefore implies a design of space (fortunately now well established) that is inclusive and does not discriminate in the use of some places of culture.
Accessibility also takes shape in processes intended to make usable structures that are closed (as, for example, has occurred due to the pandemic) or to put back at the center of the urban scene places that represented meeting spaces and had meaning precisely because of the relationships generated there. In this sense, technologies provide the tools to reflect, investigate and represent the values of contemporary society through the 're-appropriation' of cultural heritage and public space through the virtual construction of narratives aimed at involving users and communities. The processes of digital mediation thus aim, in a sense, at bridging distances, allowing anyone to see, feel and perceive something that is virtually (re)produced and reproposed in an infinite number of possible declinations,

Fig. 2. Installation *"Lacrime nella pioggia"* in Florence, by Felice Limosani. it is a multisensory digital narration, made of lights, projections and water falling from the ceiling, thus expanding perception beyond sight, on an acoustic and environmental level. (© Felice Limosani, 2019)

using inclusive communicative strategies that manifest the social desire to bring "things spatially and humanly closer together" (Benjamin, 1939), in this case, through the technical reproduction of art [fig.1].

3. Digital narratives for Cultural Heritage

Digital technologies and the logic of sharing are fostering the emergence of completely new models of use and business (De Felice, Petrillo, 2021) and provide the tools to reflect, investigate and represent the values of contemporary society through the 're-appropriation' of cultural heritage and public space through the virtual construction of narratives aimed at involving users and communities [fig. 3].
Through digital projection tools, the exploration of the experiential dimension of heritage takes place by enabling cultural access to and relationship with cultural heritage: virtual re-elaborations and the possibility to make the experience holistic, through multiple stimulation of different sensory channels, as well as creative aesthetic digital experiments, are some of the expressive possibilities of digital resources to implement inclusion strategies.
We know that a fruition modulated by technologies includes multiple spatial and temporal variables, which contribute to structure the cultural experience. Indeed, by definition, digital installations are ephemeral, temporary, repeated and repeatable. They are bound to a specific time, as well as to a site, promoting the logic of local actions that can be disseminated as implementable practices throughout Europe and the rest of the world.
In the specific case of digital projections applied to cultural heritage, time and place of projection are particularly important. Time identifies a duration, a possible repetition, a unique moment to watch an installation, or an infinite time, where the performances are recorded and therefore kept in an "eternal" virtual memory that characterizes the accessibility of the installation, in a permanent way, even long after its conclusion. As far as space is concerned, there are several possible relationships between the projections and the architectures that support them. Some images are closely linked to the facades on

Fig. 3. Installation representing the monologue from "The Great Dictator by Charlie Chaplin, as part of the event "Pensieri Illuminati" (Milan, 31/12/2020). It was inspired by the Digital Humanities in which messages received remotely from the public were converted as parameters, using the 'Unity' graphics engine, to obtain abstract generative graphics with aesthetic and artistic purposes. The performance was accompanied by a soundtrack composed as a rising musical canon (© Felice Limosani, 2020).

which they are projected (as in video mapping installations), taking their contours or lines and transforming them, making a surface that is typically solid and static, dynamic.
The projection helps the viewer to get to know that architecture, reading its styles, overlaps and proportions, and thus offers a new viewpoint that allows the spectator to see details never noticed before. Other lighting effects, on the other hand, although designed for a specific building, do not tell anything about the architecture and only use it as a surface on which to project. In these cases, the scenic and chromatic effects, the free forms and the ability of the operators and artists, allow to convey cultural messages, to translate them into aesthetic performances (as in the case of Felice Limosani's "Pensieri illuminati" projected on the Duomo of Milan - fig. 3). Those who deal with the content of the narrative, choose the story to be proposed to the public in relation to the architecture and the space, with the knowledge that they can obtain an infinite possible repertoire of beautiful installations and digital projections applied to cultural heritage.
From these considerations emerges a concept of space, made up of distances that modulate relationships and sharing. Space is manifested virtually, with the consequence of eventually experiencing "a closeness in distance". The video becomes a bridge towards something that is not near, but somehow becomes reachable (Casetti, 2020).
Among the future perspectives for the enhancement of cultural heritage, the concept of 'extended reality' is emerging. This term is used to describe the whole spectrum of immersive technologies. Many museums and exhibitions are experimenting with its use, allowing visitors to interact with the artworks, architecture and urban spaces in an innovative way, allowing them to feel more emotionally involved. Technologies supporting such experiences include Virtual, Augmented and Mixed Reality, but also

haptics, gesture recognition, spatial detection, voice recognition, 3D audio systems, drones and cameras. A multisensory and inclusive approach that extends (for all) the ways of using space.

4. Conclusions

The concepts of accessibility and inclusion sometimes converge and align themselves with common objectives that aim to create conditions of usability of the heritage that do not exclude anyone and that can thus be an example for social policies and common practices of "good living". Making a cultural asset 'accessible' means producing inclusive memory, reuse and valorisation; it means modifying architectural and landscape areas so that they can fully participate in the life of the contemporary city by identifying functions capable of offering a new value, meaning, significance and way of experiencing the urban space of tomorrow. The ephemeral transformation of a place, through digital projections, responding also to characteristics of flexibility and non-invasiveness, satisfies in different ways the objectives set by the New European Bauhaus, opening up to infinite possible forms of expression capable of enriching and improving our collective spaces, with a view of sharing, accessibility and inclusion.

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The identity drawing of places. Bell towers in sixteenth-century Naples by Antoine Lafréry

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Abstract

The bell tower, as a slender structure, is an element with an inherent vertical nature whose visual-perceptual impact is such as to make it an evident identity landscape's 'marker' where it is located. The aim of this paper is to analyse the Neapolitan bell tower system in relation to the image of the 16th century city. Specifically, the first phase of study involves identifying the bell towers on the "Pianta della città di Napoli" by Antoine Lafréry in 1566. Instead, in the second one the data emerged from the studies on the cataloguing of Neapolitan bell towers made it possible to carry out a comparative analysis of the morphological characteristics among the types identified in Lafréry's view and their contemporary counterparts.

Keywords

Bell Tower, descriptive cartography, classification, architectural typology, comparative analysis.

1. Introduction [VC]

The following contribution studies the architectural element of bell tower, which lends itself to being interpreted as a sign of places identity and whose literature still offers few studies on an urban scale (Coden, 2015). Specifically, in this paper the bell towers of Naples city will be examined.
This investigation field has already been faced by the drawing discipline within the competitive intra/Athenaeum project *PREVENT - Integrated PRocedure for assEssing and improVing the resiliENce of existing masonry bell Towers at territorial scale* (financed with the *Valere Programme 2019* by the University of Campania *Luigi Vanvitelli* with Gianfranco De Matteis (principal investigator) Sergio Sibilio and Ornella Zerlenga (team leader), through a fact-finding action of Neapolitan masonry bell towers with the aim of proposing interventions for cultural dissemination and developing strategies for their preservation and enhancement (Cirillo & Cicala, 2021). Instead, this study takes a sample of approximately one hundred bell towers, referring to the bell towers represented in the Lafréry's "*Pianta della città di Napoli*" (1566) with the aim of highlighting the identity features of 16th century Naples through the presence of these territorial markers. In fact, the result is a comparative investigation of the morphological characteristics of the bell towers identified in Lafréry's view and their contemporary counterparts.

2. Bell towers in sixteenth-century Naples's city by Antoine Lafréry, 1566 [RM]

From the middle of the 16th century, the widespread affirmation of the city representation '*in veduta*' (on view) contributed to the production of 'ornamental' types of descriptive urban cartography no longer visualised in plan but through frontal, pseudo-axonometric and pseudo-prospective views. This new way of representing the cities would have favoured a visualisation in the space useful for the urban palimpsest knowledge (Zerlenga, 2016). As many Italian cities, Naples has a rich iconographic heritage, whose views highlight the plastic characteristics of the built environment. Although there have been many successive views of the city, increasingly accurate and faithful to the topographical reality of the

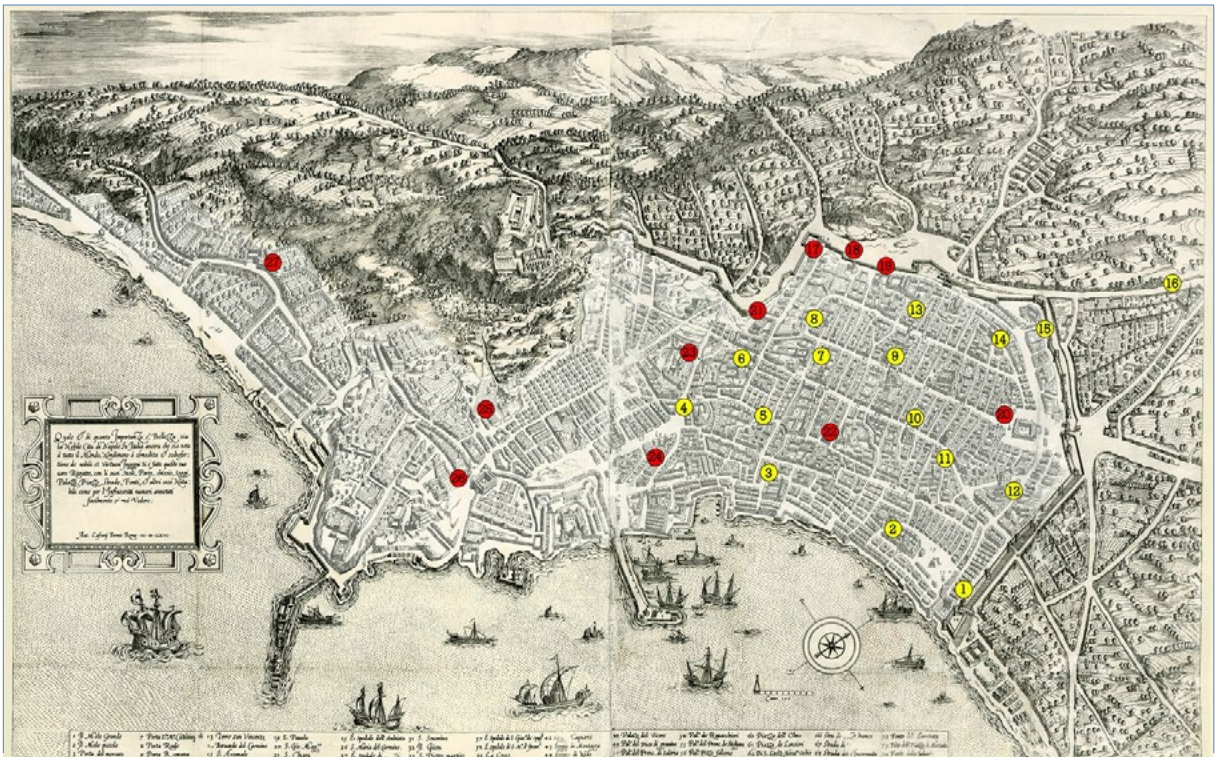

Fig 1. Mapping of the bell towers present in the Pianta della città di Napoli (map of the city of Naples) by Antoine Lafréry: cf. Fig 2 for numerical references (graphic elaboration by Riccardo Miele).

places, the subject of this research focuses on the *Mappa della città di Napoli* engraved by Dupérac and printed by Lafréry in 1566 (Rome). This was considered one of the first representations of the city in views and the most important of the sixteenth-century testimonies (De Seta, 2004). Due to the considerable importance of the city, the view is divided into seven itineraries, which is why there is a heading at the bottom with seventy-six reference numbers (two of which are repeated erroneously) associated to the main buildings of political and religious power. The bird's eye view shows in pseudo-axonometry the urban layout seen from the sea and whose boundaries are constituted to the east by the *Ponte della Maddalena* (Maddalena's bridge), the road to Poggioreale and the Sant'Antonio Abate borough; to the north by the flourishing Capodimonte hill and to the west by the Posillipo and Riviera di Chiaia area, towards which the city timidly begins to open up [fig. 1]. At first reading of the urban layout the numerous bell towers, both for the favorable point of view adopted and for their own morphological characteristics, emerge from the lower surrounding built fabric as punctiform signs distributed within the city. The accurate reading of the urban layout and, more specifically, of the boundary given by the ancient city walls was fundamental in this first phase. In fact, the analysis of the latter, which developed from the Carmine rampart to the slopes of Sant'Elmo hill, made it possible to define the study area limits, bringing them up to date [fig. 2]. The identification and cataloguing methodological actions were initiated using the open-source software *Google Earth Pro*. This phase, from which emerge the transformations of the city during the centuries, has allowed us to distinguish twenty-seven bell towers, each of which has been associated with a numerical identification code [fig. 2 on the left].

The subsequent typological analysis is the result of a critical process from which similarities and differences emerge, as well as morphological characteristics and graphic languages useful for an immediate reading of the architectural model. The analysis identified essentially three types: tower, double tower, and sail; the first is certainly more common, while the other two are rarer. The next phase was to analyse the constituent components such as the shaft, the façade elements, the belfry, and the roof. The planimetric shape of the shaft was evaluated: quadrangular is common, polygonal is rare (octagonal only), and circular is totally absent. Another aspect analysed was the presence of openings in the shaft, as well as the rich decorative apparatus that distinguishes them. Lastly, the study of the

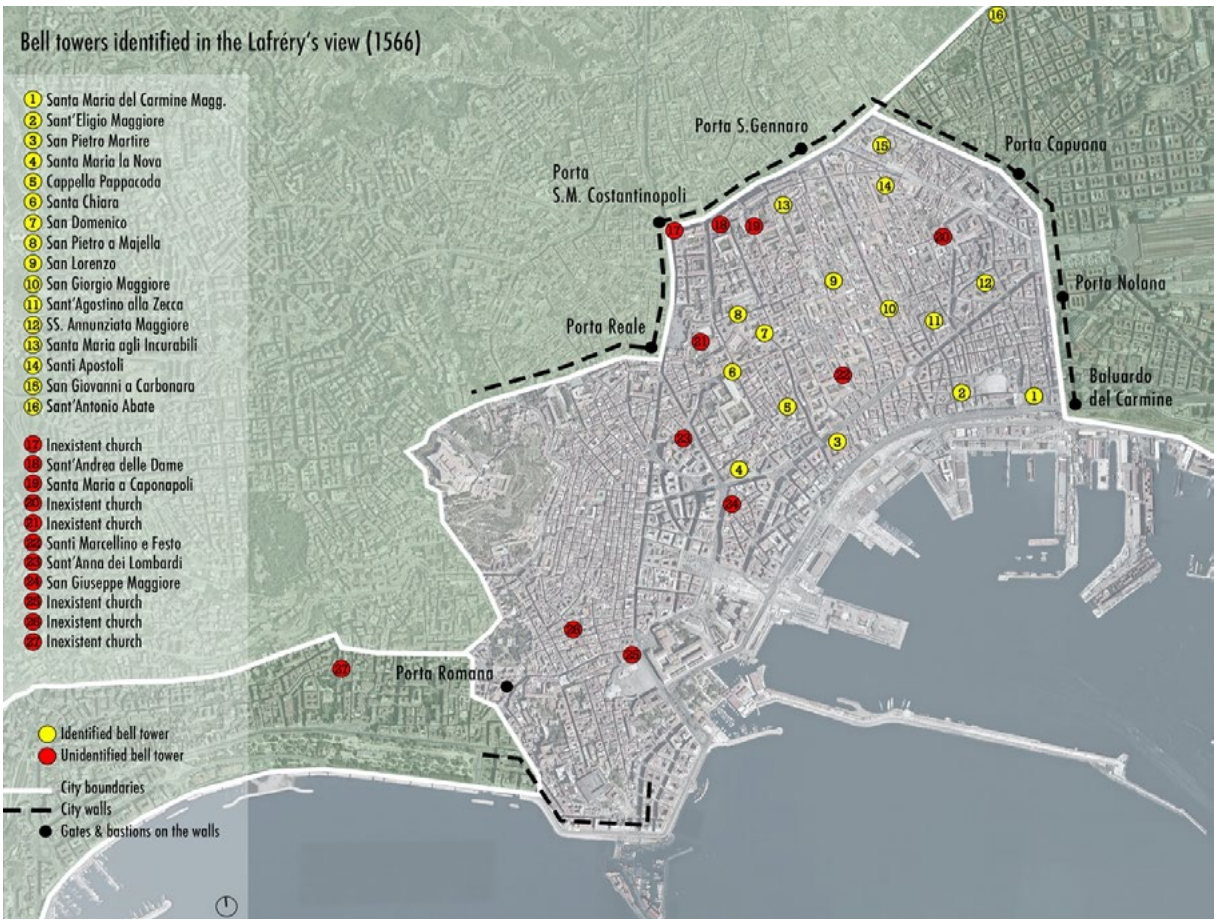

Fig 2. Identification of the 16th-century city limits and identification of the bell towers based on a reading of Antoine Lafrery's *Pianta della città di Napoli* (map of the city of Naples), 1566 (drawing by Riccardo Miele).

in the shaft, as well as the rich decorative apparatus that distinguishes them. Lastly, the study of the roofs identifies multiple configurations, from flat, pitched, pyramid (high or low), conical, dome-shaped, to the most complex bulb or pear-shaped types.

3. Methodology of investigation [VC]

The originality of production can be seen in the comparison between what emerged in the first phase described and the results of the typological analysis carried out within the *PREVENT* project. The studies carried out on Lafréry's historical cartography have made it possible to launch an investigation based on a comparison of the morphological characteristics of the bell towers of sixteenth-century Naples with their contemporary counterparts. This was done to evaluate not only similarities and differences, but above all to understand the identity of a city that was already represented in the 16th century through the multitude of its bell towers. What emerged from the typological characterisation described is compared to the reading of historical cartography which led to the identification of twenty-seven different architectural types, two of which were outside the city walls. Despite the summary representation of the built environment legitimised by a large-scale restitution of the landscape, the comparison nevertheless made it possible to make important considerations on architectural types, transformations, and the consequent impact in visual-perceptual terms on the city's image. This first phase has made it possible to distinguish two types of case: that of existing and/or changed bell towers and that of those that do not exist. Among those still existing and on which the comparison is being made are the bell tower of Santa Maria del Carmine Maggiore, Sant'Eligio Maggiore, San Pietro Martire, Santa Maria la Nova, Cappella

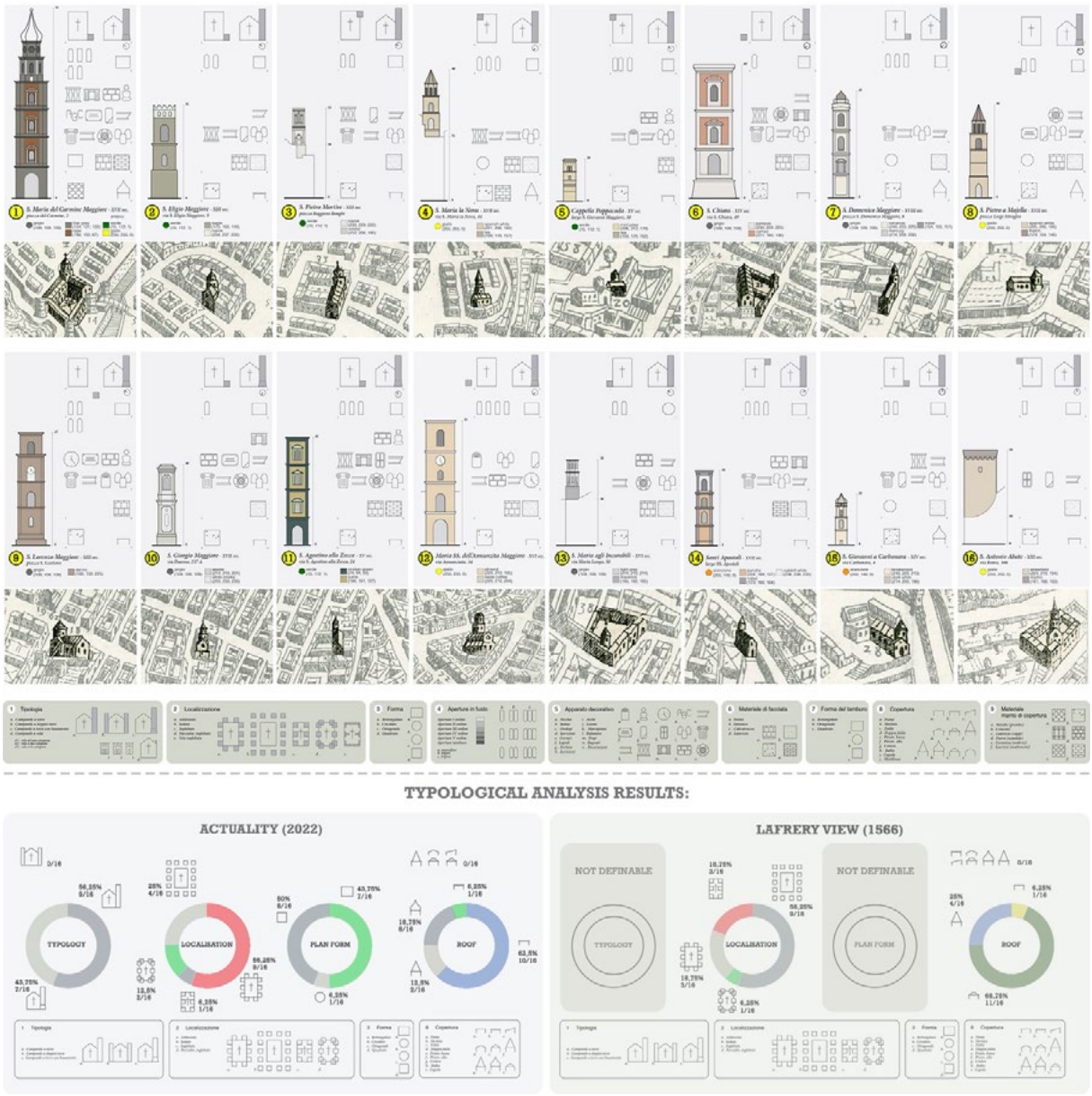

Fig 3. Above: typological analysis of the identified bell towers and comparison with the corresponding ones in the Lafrery view; below: summary representation of the analysis expressed in percentage data (graphic elaboration by Vincenzo Cirillo).

Pappacoda, Santa Chiara, San Domenico, San Pietro a Majella, San Lorenzo, San Giorgio Maggiore, Sant'Agostino alla Zecca, Annunziata Maggiore, Santa Maria agli Incurabili, Santi Apostoli, San Giovanni a Carbonara and Sant'Antonio Abate. Instead, about non-existent bell towers we can distinguish two cases: that of religious buildings that do not exist today and that of religious buildings that existed but no longer have a bell tower (Sant'Andrea delle Dame, Santa Maria a Caponapoli, Santi Marcellino e Festo, Sant'Anna dei Lombardi and San Giuseppe Maggiore (also known as San Diego all'Ospedaletto). In terms of results and assuming the reliability of the bell towers representation in the Lafréry's view, the reading of the morphological comparison [fig. 3 above] reveals some inconsistencies regarding the location of the bell towers for which (both in terms of what has emerged and of architectural styles that were certainly later), it is possible to hypothesise possible reconstructions and/or rebuilding that altered their original configuration and location (Sant'Eligio Maggiore, Santa Chiara, San Domenico,

San Pietro a Majella, San Giorgio Maggiore, Sant'Agostino alla Zecca, Santissima Annunziata). Instead, excluding the cases of evident reconstruction for which the comparison would be in vain, by the shaft analysis is possible to see how much the bell towers subsequently reached greater heights through the addition and superimposition of further orders (Santa Maria del Carmine Maggiore, Santa Chiara, San Lorenzo, Santa Maria agli Incurabili, Santi Apostoli, San Giovanni a Carbonara) or through reductions in height due to demolition (Sant'Antonio Abate). Lastly, the roofing system is analysed for which the pyramid type is recurrent in the high or low variant. In this case, the comparison shows an almost total dissimilarity with the current typologies, except for two of the analysed cases (Santa Maria la Nova, San Pietro a Majella).

3. Conclusions and future developments [VC]

The bell towers' typological and morphological characterisation, the subsequent analysis and comparison proposed, while on the one hand contributing to a complete knowledge of the model through its graphic representation, on the other contribute to considering the importance of a 'tall and slender' architectural genre that confirms its strong iconic value as an identity marker of the city's image through its multiple figurative languages. Therefore, the analysis carried out and the subsequent synthesis representation expressed in percentage data show that it was difficult to read the recognition of the shape of the planimetric basin and the decorative apparatus of the bell tower. Conversely, through the graphic synthesis of the signs present in Lafréry's view, it was possible to read the number of architectural orders that characterise the top of the bell tower and the type of roof, the vast majority of which is pyramid-shaped [fig. 3 below].
In short, from the earliest representations of the city of Naples '*in veduta*' (on view) to the more detailed ones drawn up between the 17th and 18th centuries, the image of Naples has always appeared linked to that of its bell towers, which still characterize its profile (Zerlenga et alii, 2020). For this reason, this contribution constitutes a first study that in the methodology of investigation and data reading will be replicated for other descriptive and topographic cartographies of the city of Naples such as the Alessandro Baratta's *Fidelissimae urbis neapolitanae […]* (1629) and *La fedelissima città di Napoli con la nobilissima cavalcata […]* (1632), the Giovanni Carafa's *Mappa della città di Napoli e de' suoi contorni* (1750-75) and, only for the planimetric reading, the Federico Schiavoni's *Pianta di Napoli* (1872-80).The ultimate valorisation goal wish to the preparation and thematic elaboration of the iconography of the places and cases investigated, aimed to elaboration of complex digital maps organised on temporal layers for the virtualisation of information in the field of musealisation and cultural enhancement.

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New technologies for the city and the landscape. A versatile application example

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Abstract

Artistic-communicative technologies, from the birth of writing, printing, photography, to artificial intelligence are tools for the intellectual extension of the human being. The research focuses on the possible usefulness of augmented reality as an object of culture service and examines the stairscale, which has always represented the act of "climbing" but which over time passes from the ideology of design to a spatial-temporal configuration representative of architecture. The Neapolitan open staircase is, at the same time, a space that represents different factors, which are realized and manifested in it. Inspiration of the scene in the films, as in "Miseria e Nobiltà, (1954)", in which the fusion of the comedy and architecture of solids and voids, creates a harmonious and constantly changing result, Years later with the use of the lift generates a new concept of collective enjoyment and social relationship, a further point of view, intimate, but also useful as a space (scene) for immersive events created with new technologies.

Keywords

staircases, scenery, augmented reality, virtual reality, sustainable tourism.

1. Introduction

Inside the historic Neapolitan building, the staircase is part of an access system between public and private. The small external space does not allow to focus the entire facade of the building, so the passer-by is led to observe inside the building. The curiosity induced in the viewer can be traced back to the experience, which foresees the sensory extension through the use of Augmented Reality (AR). Thanks to the help of technology, it is possible to add this new interactive experience to the users, a deeper knowledge of the architectural artefact, and of cultural regeneration.

2. Augmented reality at the service of culture

In 1999 the science fiction film Matrix triumphs from which the title derives from the Latin and means generating / matrix, or mathematical structures of tabular type work in computer science to associate data systems between them. In the case of the film, The Matrix is represented by a sort of cyberspace or rather a simulated reality created by machines.
«*Matrix is everywhere. It's around us. Even now, in the room where we are. It's what you see when you look out the window, or when you turn on the TV. You feel it when you go to work, when you go to church, when you pay taxes. It is the world that has been placed before your eyes to hide the truth from you*» Quote from co-star Morpheus when he explains to the protagonist Neo what Matrix is made of. In fact, what can also be ideologically the basis of the concept of augmented reality.
Today augmented reality is a bit the myth of Plato's cave which refers to the discovery of the reality of the things that surround us, but which in our case is understood as multiple realities idealized on the measure of our imagination or to satisfy our needs artistic representations. Technologies, the birth of

Fig. 1. Augmented reality applied to an image. (V. Marzocchella)

writing, of printing, of photography to artificial intelligence are all tools for the intellectual extension of the human being. The advent of new techniques has always been a subject of interest on the part of sociologists and scholars above all for their mass character, it is enough to remember Walter Benjamin in "The work of art in its technical reproducibility"; the German sociologist with his romantic-capitalist idea of art stated that the advent of new techniques and their process of development and dissemination, not only are they inevitable but largely positive, because they make art more democratic and accessible to the masses. But at the same time, he states that technical reproducibility destroys the experience of reality by contemporary man. What Benjamin calls the destruction of the Aura. His theory on the democratization of art is still relevant but with regard to the death of the aura through the technical reproducibility, it is now only bound to a romantic concept.
The proposed experience involves sensory extension through the use of Augmented Reality (Augmented Reality or AR). Any work will be enriched, or "augmented", by content that cannot be perceived in the real world and only thanks to the use of devices (tablets or smartphone) it will be possible to access them (fig.1), revealing digital contents that allow to have a deeper knowledge of the work or architectural object under examination. In the future we will have apps that will inform tourists about the architectural elements observed, providing measurements, studies of proportions and in-depth studies of history, all usable in digital environments such as augmented reality.

2. Points of view

In Naples, during the eighteenth century, the portal and the staircase of many buildings took on the role of real scenography. Its configuration, the alternating light-shadow-light scan, allows you to read the street - entrance hall - courtyard succession at the same time, attracting the attention of the passer-by who, after passing the entrance hall, turns his gaze into a small area, (the courtyard), an open space

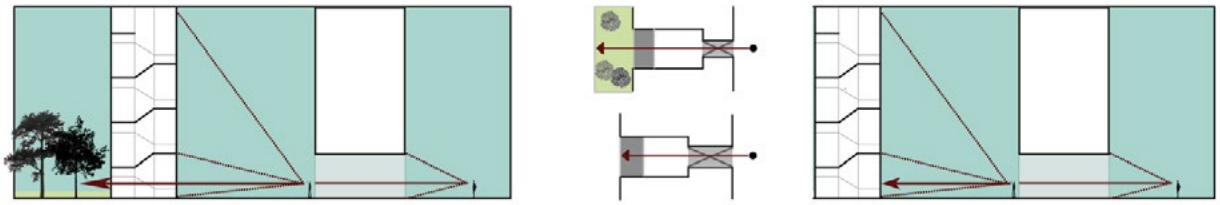

Fig. 2. Access systems of the residential architecture: portal - entrance hall - courtyard - staircase – garden. (in O. Zerlenga, 2014)

where in most of the Neapolitan palaces of the '700 there is an "open staircase", often placed in front of the entrance. The spatial dynamism is generated by the changing course of the
ramps, by the vaulted structures, variously articulated and by the perforated walls that guide the curious gaze beyond the staircase towards the courtyard, generating multiple points of view, obtaining a multidimensional perceptive context (Zerlenga, 2016), (fig. 2). The architectural complexity of the staircase in the theater and cinema tends to overturn. The access system is not seen from the outside, but the point of view starts from the apartment continuing in the opposite direction with the staircase - courtyard - entrance hall - portal - external road. In the specific case of the comedy *Miseria e Nobiltà*, the scenes open in an apartment. The observer's attention is focused on the environment which helps him to add other key elements, useful for a correct understanding of the scene. Subsequently, the attention shifts to the scale, which acts as a scenario for the actors, dividing various temporal sequences, where each group of actors is assigned a specific position for the inexhaustible points of view generated by the scale. The staircase becomes the real stage at different altimetric levels, in this sense the vision moves towards the vertical plane enriching the scene with new multiple perspectives, transforming itself from a static to a dynamic element, accompanying the movement of the actors' acting and also giving points of view different to video shooting. Everything communicates, everything interacts, everything is part of the scene, stimulating the invisible to the eyes, almost imagining a real open-air theatre (fig. 3). The analysis conducted leads to the search for new methodologies to enhance this type of architecture which, over the centuries, has maintained its scenographic character. With the help of new technologies (such as the very new reality) and applying the recent need to enhance existing spaces, instead of creating them, the transition from the private to the public sphere can take place by bringing visitors inside existing spaces and taking part in virtual shows and info, which overlap different realities on the real environment. For its realization, the project is divided into some preliminary steps: the survey of the stairs was carried out with the aid of new technologies based on laser scanners and photogrammetry, which made it possible to reconstruct the three-dimensional models; the latter serve as the basis on which virtual objects are superimposed. The program used for Augmented and Virtual Reality is "Unity3d", a development environment used for the creation of 3D video games and other interactive content. The research is still in an embryonic phase and the next phase will be to animate the models of the space under analysis. Real actors and sound orchestras can be involved, moreover transversal events, such as temporary exhibitions or guided tours, could lead the spectators inside the courtyards to learn more about this and other types of architecture.

3. Conclusion

La città non dice il suo passato, lo contiene come le linee d'una mano, scritto negli spigoli delle vie, nelle griglie delle finestre, negli scorrimano delle scale, nelle antenne dei parafulmini, nelle aste delle bandiere, ogni segmento rigato a sua volta di graffi, seghettature, intagli, svirgole. […] È delle città come dei sogni: tutto l'immaginabile può essere sognato ma anche il sogno più inatteso è un rebus che nasconde un desiderio oppure il suo rovescio, una paura. Le città come i sogni sono costruite di desideri e di paure. (I.Calvino, 2016).

A city cannot be known only through the visible, often the invisible, all artistic and architectural expressions considered minor, are very important to characterize the city of a landscape. This project

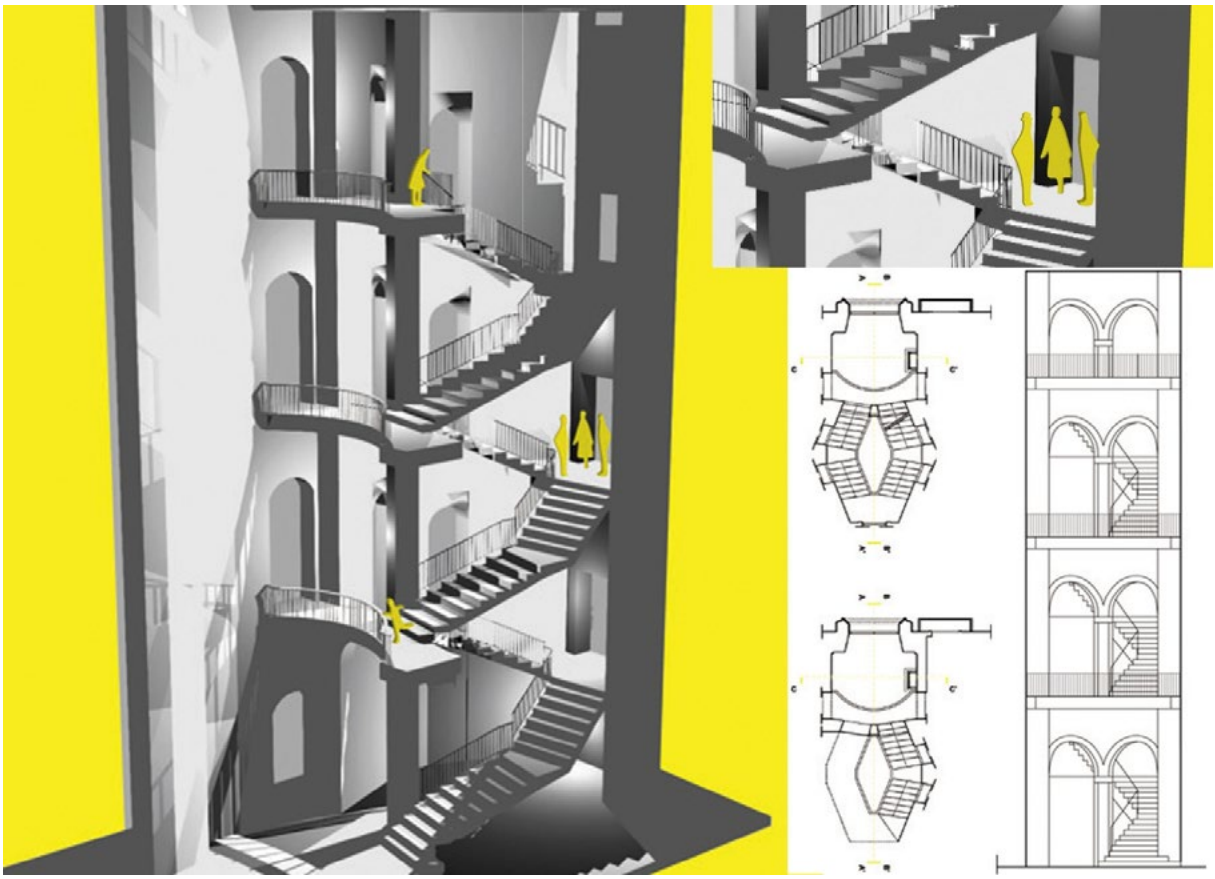

Fig. 3. Planimetric reconstruction of the staircase of the film Miseria e Nobiltà. Plan of the first floor, third floor, section A-A'; C-C'. Render of the staircase of the film Miseria e Nobiltà. (in V. Marzocchella, 2019)

aims to enhance the hidden heritage of a city and to make the works better known than the city, but the intent is to apply the same methodology to other contests, also drawing on local traditions and cultures.

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Knowledge and representation of the civic tower of Tora and Piccilli.

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Abstract

The research presents the results of the knowledge and representation of the Norman Tower of Tora and Piccilli in the province of Caserta.
The construction of the Norman tower of Tora and Piccilli is part of the first phase of the process of building defensive installations by the Norman armies in Southern Italy.
It is an isolated tower within the walls of the castrum with a truncated pyramid base.
The activities involved initial bibliographic studies of the writings of local scholars and photogrammetric survey activities.
The plan and elevation drawings were obtained by extrapolating the data from the point clouds produced by photogrammetric software. Digital models were produced for a visualisation of the tower.
The results achieved aim at the knowledge of the architectural artefact for the protection and enhancement of the asset in relation to the municipality and the surrounding area.

Keywords

Knowledge, representation, survey, tower, Caserta

1. Introduction

The research proposes a graphic study of the site of Tora e Piccilli, with particular attention to the Norman Tower. Tora e Piccilli, historically known as Thorae, is a small village in the province of Caserta, on the slopes of the volcanic complex of Roccamonfina, an ancient eruptive area.
According to Cato, the Samnites were responsible for the foundation of the first nucleus of fortified buildings in the area of Tora and Piccilli and the nearby Presenzano, later identified with the city of Rufrae. During the wars, the Roman troops had the advantage over these peoples in the 3rd century BC and began the colonisation of the entire Campania region. The same fate befell the town of Presenzano (originally Rufrae), of which some ruins can still be found today along the Via Casilina (a medieval road linking Rome to Casilinu, today's Capua) between Tora and Piccilli and Presenzano. Other finds in the area of the municipality of Tora and Piccilli testify to the existence of agricultural settlements called 'ville rustiche'.
The first settlements in the territory of the village of Tora e Piccilli were of Norman origin. These settlements were born out of military needs, completing the conquest of the Longobard, Byzantine and Arab territories. The Normans began to build their fortresses to defend themselves against enemy attacks. A further military tactic was the use of pre-existing fortifications adapted to the new military needs, for their defence or built from scratch according to Norman architectural types.
The Normans settled in the territory in two ways: firstly, by occupying the small agricultural settlements on the outskirts of the city, thus strengthening this capillary system of territorial control; secondly, by founding closed and fortified spaces, generally on rocky outcrops, protected places, capable of controlling, using and safeguarding the new territorial assets.
From an architectural point of view, Norman fortifications could be divided into two different types: motte

Fig. 1. The civic tower of Tora and Piccilli, view from the village.

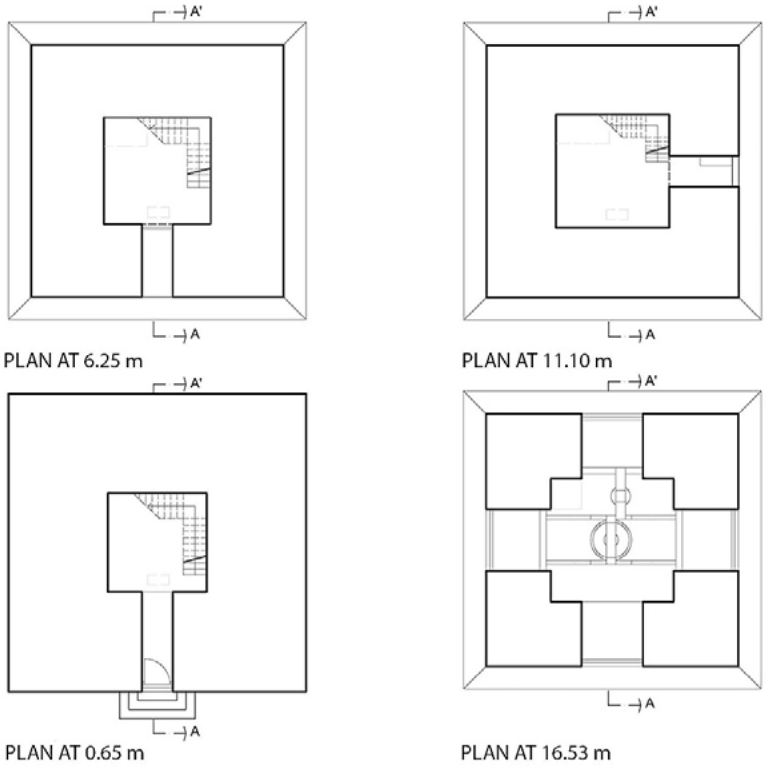

Fig. 2. The civic tower of Tora and Piccilli, plans of the fortified building

and dongioni. The motte is an architectural model from beyond the Alps.
They are made of wood and earth and involved the construction of a truncated cone-shaped hillock with a diameter of between ten and fifty metres and a height of between three and fifteen metres. At the foot of the hillock, there was almost always a moat bordered by a courtyard, also known as a low court. (Barba, Cardone, 2013)
The use of the motte was probably most alive and successful in flat areas, where defence was made more difficult by the presence of dense and compact woods that obstructed the view of the horizon.
This specific type of artefact made of wood and earth, although cheap and quick to build, must have appeared to the Norman builders to be too fragile to resist the assaults of war, fires and the pitfalls of time: as the conquest proceeded and took shape, the Norman lords began to build castles with other materials, in stone, in southern Italy we remember some examples of motte, such as San Marco Argentano and Scribla, in the province of Cosenza.

2. Historical notes and stages of knowledge

The From the tower, it was possible to watch over the mountain passes and the agricultural vehicles used by shepherds at the time, making it a strategic military lookout point. (Apollonio, 2010)
The construction of the Norman tower of Tora and Piccilli is part of the first phase of the process of building defensive installations by the Norman armies in southern Italy.
It is an isolated tower within the walls of the castrum with a truncated pyramid base. It appears, from its squat appearance, to be a tufa masonry keep with a square base measuring 9.20 metres at the foot and 8.20 metres above; it is about 23 metres high.

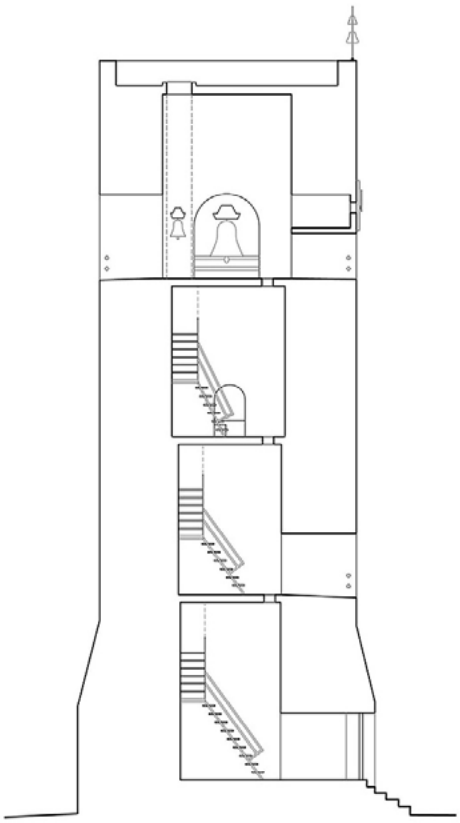

Fig. 3. The civic tower of Tora and Piccilli, section of the fortified building.

The entrance to the tower is on the south side and, as in similar cases, is at a higher level than the ground level, preceded by six steps; it is assumed that access was through a retractable structure and that, over the centuries, the ground level has been raised.
Its current appearance shows the passage of centuries, as the tower shows no traces of the pre-existing crowning, which must have originally been crenellated. The basement area, on the other hand, shows its Norman origin.
In fact, it is possible to recognise a masonry consisting of ashlars of tuff of different quality and size, roughly squared blocks of lava stone and fragments of brick.
The deterioration of the tuff ashlars and the presence of mortar courses, which are not perfectly horizontal, would seem to indicate that this type of wall is the oldest in the tower, probably belonging to a primitive building. The stone tower represented the heart of the fortified complex; in the past, it was the residence and the bulwark in case of attack. The Norman masti were between 15 and 20 metres high and their wall thickness gradually decreased as they rose. Inside, the central spine wall supported the floors, often supported by barrel or cross vaults.
The internal vertical connections were made by means of wooden or stone staircases cut into the thickness of the walls.
On the first floor was the main entrance, which was accessed via a retractable bridge. The movement was controlled by a winch which, by means of chains and pulleys, imparted the rotation to the two rollers, which often rested on a pillar placed a few metres from the edge of the donjon wall, or by means of stairs made of masonry which led to the first level passing through a forepart smaller than the donjon.
Wooden ladders were used to reach the level between the pillar and the ground level. On the first level there was the reception hall and above it the lord's private chamber. On the second and third levels, there were commonly the additional living quarters.

Windows were only made in the upper floors of the fortress, although sometimes slits were also made in the walls of the ground floor.
The roof of the tower was flat and a battlement at the top defined the profile of its parapet. The keep was then protected by a wall, built with materials found in nearby sites and equipped with quadrangular flanking turrets. A moat ran parallel to the defence curtain to prevent the approach of war machines.
Although the civic tower of Tora e Piccilli is characterised by numerous historical stratifications, a sign of the passage of man's work over the centuries, it has a typological layout, a wall fabric and architectural elements that reveal its origin, so much so that it can be included among the dungeons of Norman foundation.

3. Conclusion

The survey activities concerned the architectural artefact in its complexity as a defensive structure guarding the town.
Of great interest is the first historical document that provides the elements and states news about the tower of Tora and Piccilli. It is an illuminated parchment belonging to the local collegiate church of San Simeone. In the miniature, it is possible to identify an image of the Civic Tower and the city walls that is clearly idealised and therefore characterised by reproducing greatly simplified forms.
Starting from the historical images, (Menna, Remondino, Maas, 2016) the digital photogrammetric survey was carried out, followed by the graphic restitution and digital modelling phases. (Remondino, 2011)
The results achieved concern an initial knowledge of the places and the fortified structure analysed through the architectural survey. The subsequent phases of knowledge planned will concern in-depth structural and constructive studies of the artefact and the surrounding landscape.

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The photogrammetric survey of the Tvrdalj Fortress in Hvar

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Abstract

The present work, therefore, proposes to document and reconstruct graphically, the historical evolution of the Hvar Tvrdalj Fortress in Croatia through a series of digital drawings, but especially 3d photogrammetric modeling systems of outdoor spaces. Particular attention was paid to the digital modeling activities of the fishpond, located inside the fortified structure. The activity of representation of the Fortress of Hvar Tvrdalj was set up by providing, in an initial phase, the execution of a basic survey extended to the architectural organisms and the surrounding green space in order to define a first two-dimensional geometric model; then, in a second phase, were made the survey graphs and the consequent graphic restitution with the measurements of architectural details and the complete survey of the inner tank. The research, therefore, presents for the first time, a scientific study of photogrammetric digital survey developed through the creation of 3D digital models on a structure of great architectural and landscape interest, as well as a cornerstone of the island of Hvar for local tourism.

Keywords

Survey, fortress, Hvar, photogrammetry, cultural heritage

1. Introduction

The study is conducted through detailed and accurate photographic and iconographic documentation, survey and digital documentation with usable models.
The theme of digital modeling is of great importance, since it allows to face, according to disciplinary assumptions, such as technical-instrumental and theoretical applications, the dynamics of drawing related to both traditional and innovative digital representation. With this science the aspect concerning the visualization is determined, a fundamental element for the communication of the object examined, through which it is possible to define the final graphic rendering compatible with the purpose of the relevant activity, both relative to the knowledge of the existing and indicative for the protection and enhancement of the asset.
Three-dimensional modeling of cultural heritage starting from digital images at different scales and acquisitions with low cost tools has recently gained attention from the scientific community for the realization of innovative research and advanced digital modeling processes, due to the availability of new technologies for the recording, processing, management and visualization of 3D data (Amoruso, Apollonio, Remondino, 2010).
The present work, therefore, aims to document and reconstruct graphically, the historical evolution of the Fortress of Hvar Tvrdalj in Croatia through a series of digital drawings, but especially 3d photogrammetric modeling systems of outdoor spaces. Particular attention was paid to the digital modeling activities of the fishpond, located inside the fortified structure.

Fig. 1. Point of cloud made with photogrammetric representation software. Hvar Tvrdalj Fortress.

2. Photogrammetric survey and 3D modelling

In order to elaborate 3D digital models it is useful to clarify the scientific dynamics that regulate the relationship between architecture and graphic representation. The critical description of architecture, starting from the graphic reading of the typological imprints of the constructions of the past and the morphological configurations, with reference to the discipline of drawing, makes explicit the awareness of the scientific and cultural foundations of representation methods to understanding architecture.
In order to develop three-dimensional models for documentation purposes and graphic representations at knowledge, it is necessary that the final product includes some specific characteristics.
Of considerable importance are the precision and reliability of the details, especially in areas of discontinuity, when changing materials or changing geometry. In the field just described the containment

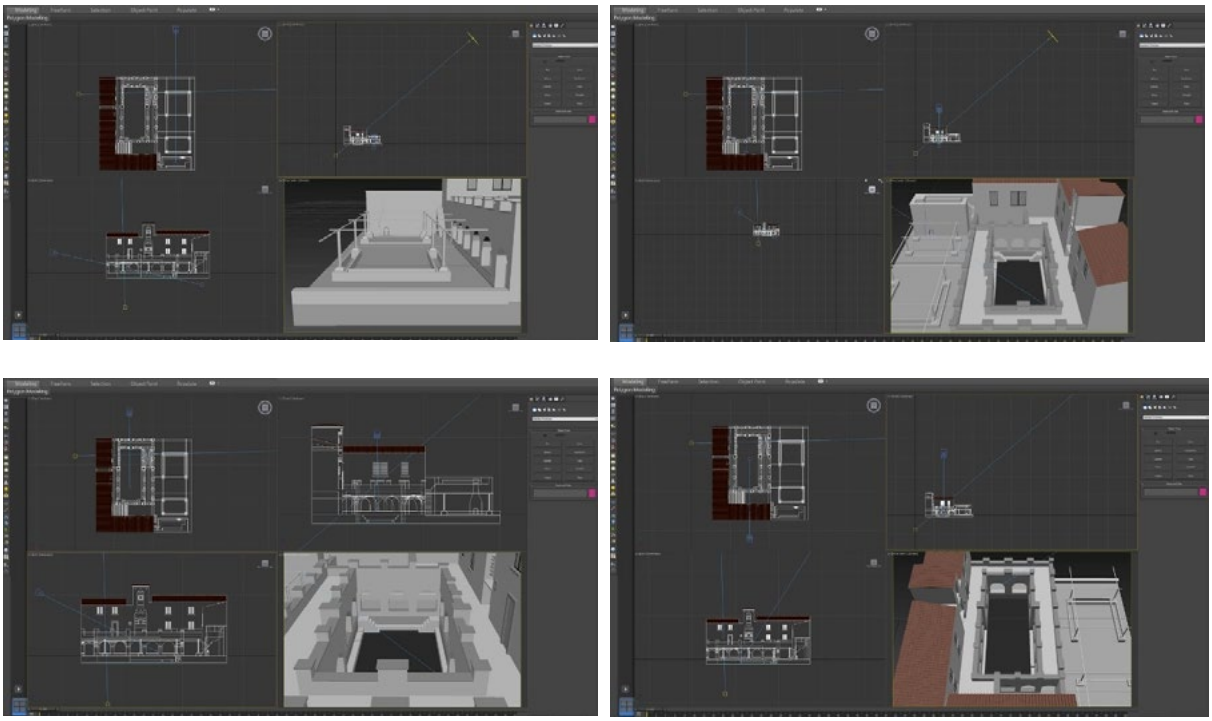

Fig. 2. Three-dimensional modelling with digital software for the visualization of the 3D model. Geometric analysis of the system of the main building shells.

of modelling costs through the use of low-cost tools and software and a rapid data acquisition time, also through the adaptability of the survey techniques to the research context, are of considerable interest in order to ensure a realistic return even at close range. New information technologies applied to the knowledge of basic geometry become a tool of restitution, analysis, information of the Hvar Tvrdalj Fortress.
In the illustrated graphic system, the drawing of architecture, that is the practical one oriented to model the object as a form, covers the main critical and theoretical exercise of method for digital technologies by defining the geometrical issues necessary for the creation of virtual models.
In this sense, the method of orthogonal double projections, parallel projections and central projections constitute the explanation of its scientific features through their inheritability to bring out the thematic and ideal contents of architecture. Digital representation, as well the implicit creation of models, besides playing a graphic role of three-dimensional reproduction of the object, is an instrument for verifying the congruence of conventional representations, such as plans, sections and elevations.

3. 3D parametric models

The digital modeling of the Hvar Tvrdalj Fortress, a Renaissance fortified villa built by the humanist Petar Hektorovic (1487-1572), which includes a lush garden, a dovecote and a fishpond surrounded by arcades where mullet swims still today, made it possible to integrate the disciplinary skills of architectural drawing with the mathematical numerical bases of the latest generation software in order to develop questionable and manageable 3D photogrammetric models in terms of conservation and protection. As is well known, photogrammetry is the science that makes it possible to obtain accurate measurements from photographs by transforming two-dimensional information into three-dimensional measurements (Manfredini, Remondino, 2010). For the digital restitution of cultural heritage, photogrammetry plays a role of considerable interest, since the images taken from digital cameras contain the information for the realization of models, the survey campaign is rapid and reduced to the shooting of photographic images often at low cost.

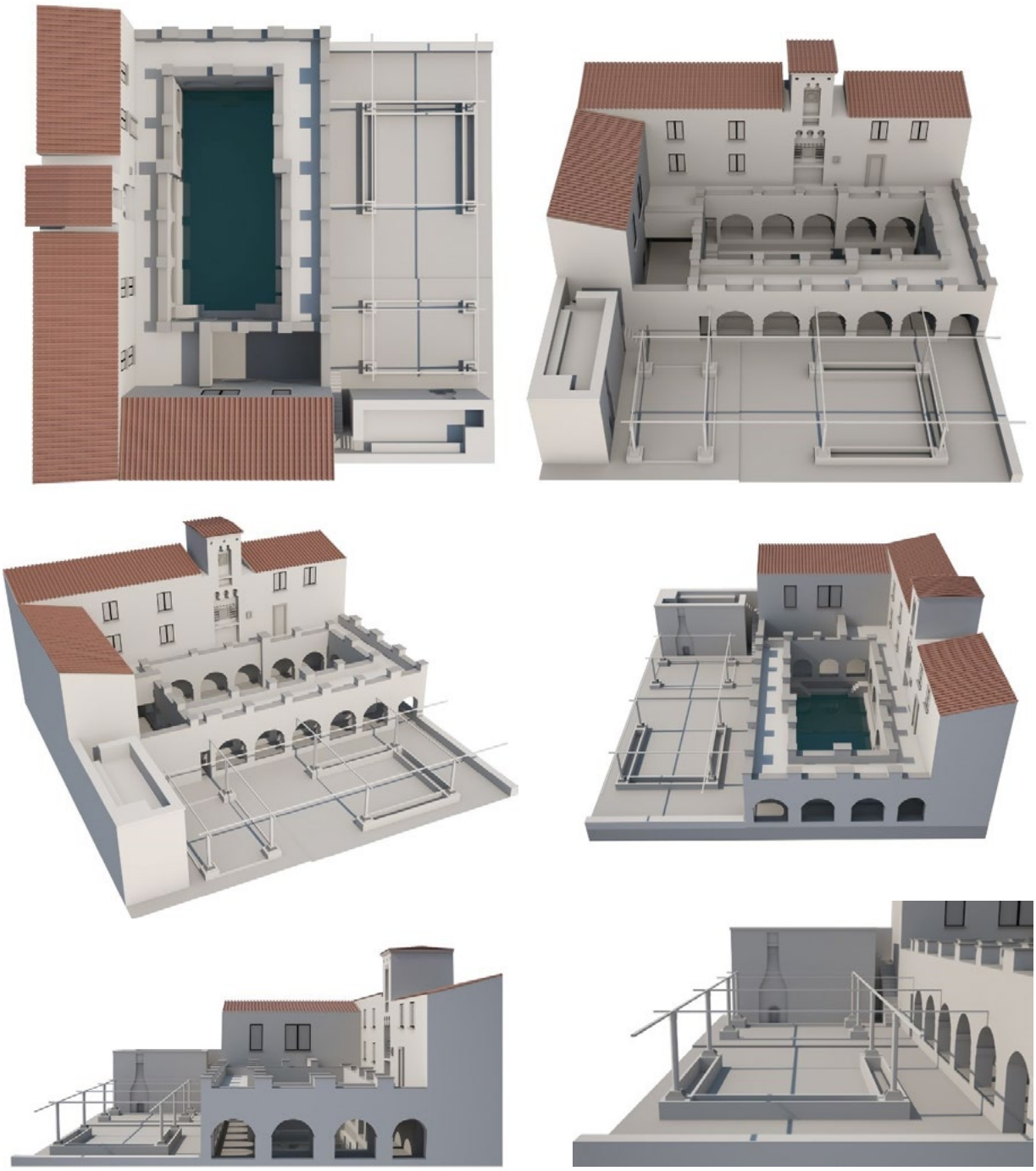

Fig. 3. Fortress in Hvar. 3D digital model realized by digital survey and parametric software.

Photogrammetry, therefore, in the context of this applied research, has the task of establishing a graphic and geometrical relationship between the images taken on site and the object of relief in a photographic shot. The photogrammetric technique allows, therefore, to determine technical information to make metric measurements on the size, shape and position of the object starting from measurements taken on images taken from both fixed and mobile supports.
It is useful, for the present research, to mention the field of passive optical sensors, as instruments such

as cameras that are used to capture the reflection of natural light on the surface of the object to be detected and, when using at least two images with two different points of view, they trigger a stereoscopic vision of a surveying object similar to what happens in human vision.

4. Conclusion

Digital modeling through photogrammetric software of the Hvar Tvrdalj Fortress has allowed the scientific documentation in order to create an interactive database. The interaction between the geometric model and the data collected, allowed the interrogation of the digital model through the use of 3D parametric software, both for graphic visualization and to plan conservation and enhancement of the asset. The research, therefore, presents for the first time, a scientific study of photogrammetric digital survey developed through the creation of 3D digital models on a structure of great architectural and landscape interest, and a cornerstone of the island of Hvar for local tourism.

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02 History, resilience, and green transition

The enhancement of Biocultural landscapes: history, heritage, and environment driving sustainable mobility in internal areas

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Abstract

The study of historical-architectural and environmental cycle itineraries, such as to constitute "know-paths" that enhance the memory of places by triggering virtuous mechanisms of revaluation of local economies, is the research theme of which we report the results in this contribution. The objective is to promote eco-sustainable crossing network models for the so-called "slow tourism".

Keywords

Sustainable mobility, History of collective identities and memories, Environmental Design, Heritage Preservation, Slow tourism.

1. Introduction

Starting from a recent international research project and its outcomes, the essay is dealt with the theme of cycle-pedestrian nets - or, better saying, of greenways as a tool for both, the territorial reconnection of isolated internal areas, and the preservation and enhancement of their historical heritage, so offering new travel models for the so-called "slow tourism".

The concept of greenways has its roots in the proposal by Frederick Law Olmsted, who experimented them between 1878 and 1890 at the Emerald Necklace Park in Boston, designing there urban and suburban green areas interconnected. In this way, he translated the English "Green Belts" in crosswalks of connection, which might have also entrusted recreational functions. (Fischer, 1986)

Nevertheless, we should consider that the notion of greenway was used for the first time by Edmund N. Bacon in the Philadelphia plan, drawn up in the late 1950s. On the other hand, it was officially defined only in 1987 by the President's Commission on American Outdoors, as «a living network [...] to provide people with access to open spaces close to where they live, and to link together the rural and urban spaces in the American landscape [...] threading through cities and countryside like a giant circulation system». (President's Commission, 1987) This American interpretation has implicitly suggested that greenways have both the capacity to connect places, without upsetting their natural arrangements, and to design the environment.

A significant example is in the German Ruhr region, specifically at Emscher Park, near Essen. In fact, an important experience was carried out there since early Nineties, basing not only on "green connectors" and "green corridors", but also on "scenic landscapes". To improve the quality of an environment so far destroyed by steel and mining activity, this project, in addition, has helped to revive the local economy, creating about 5000 new jobs, counteracting the depopulation of the area as well, becoming a model for the whole world. In the project here approached, starting from these premises, the greenways are used not only as green routes but as "paths of knowledge", that is, able to integrate environmental values with local historical and artistic heritage. In this way, the greenways allow to know and use these resources in their changes both in space, and in time; so becoming tools for reading and interpreting the genealogy of places and their uses. The international research project involved two universities, six professors and 15 between master's degree and PhD's students, through two workshops, concerning the definition of historical-architectural-environmental itineraries conceived as a network of cycle paths, creating eco-sustainable links connecting the coast of Paestum (World Heritage List place), with the Municipality of Piaggine (National Park).

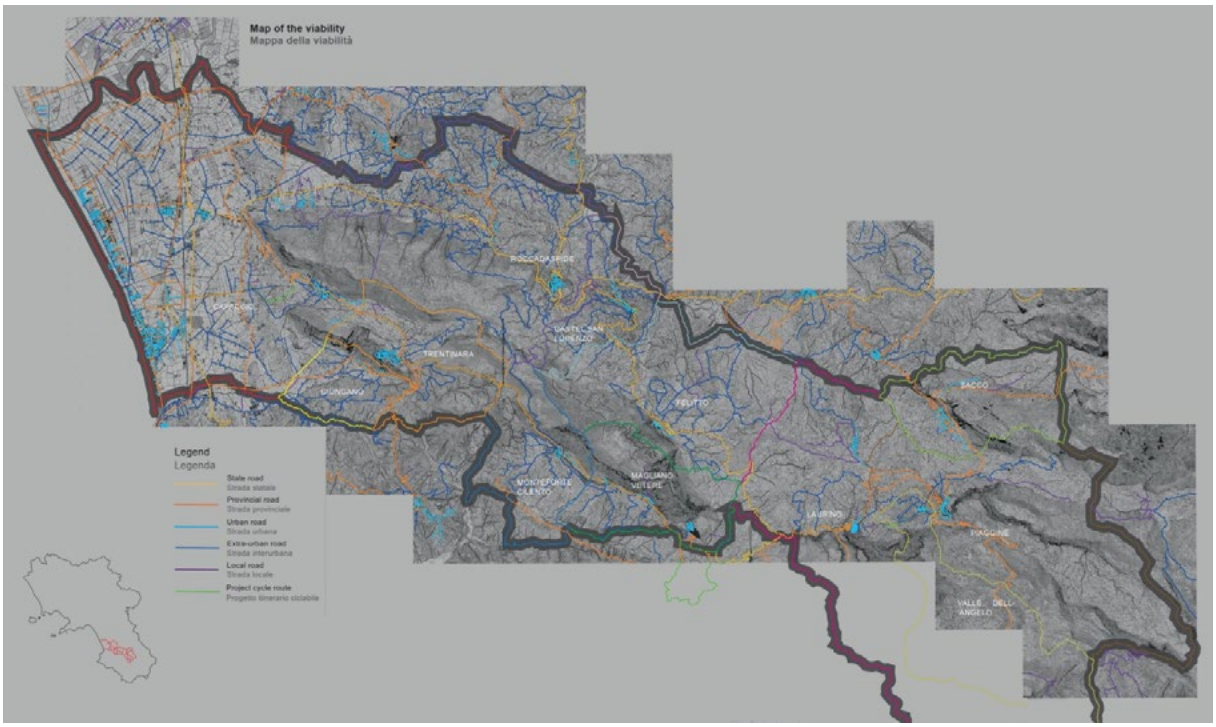

Fig. 1. Map of viability

2. Methodological approaches to design a greenway net as a driver of a place-based sustainable development

In the research project, the network of greenways is defined as a driver of the eco-sustainable enhancement of the territories through an appropriate connection between the different cultural and environmental assets.
Through the example provided by the bicycle and pedestrian networks identified in sample areas (Fig.1), the experience applied the methodological approaches of the project, defining a work protocol that can also be applied to other similar contexts.
In the framework of the described aims, the activity started from the preliminary identification of historical routes and roads and of the local cultural (architectural, archaeological, artistic and historical) (Fig. 2), environmental and landscapes resources (Fig. 3), as well as of the cycle paths existing in the single realities, in order to connect them with the new congenial routes specifically designed. This has led to the design of a multifunctional network of greenways on a territorial scale. Thanks to the exchanges foreseen with the existing infrastructures of minor environmental impact, it realizes a more suitable connection between the areas of naturalistic and landscape value and the single urban realities (also minor) that become part of the network as interchange nodes. Particular attention has been paid, finally, to the connection and enhancement of cultural heritage currently neglected and disused. (Forlani&Radogna, 2011). Their connection to the planned network of greenways, in fact, provides for their reuse as a hub to support tourist practices of a 'slow' type.

3. Greenways for Cultural Heritage Preservation and Enhancement

The design experience, distinguished this international research project, provided tools and direct actions first to promote accessibility to the Cilento's Park and to increase the qualitative-quantitative use to its heritage and assets, especially at the inner areas, improving knowledge and communication of the identity values of the park and designing possible experiential tourist routes, able to systematize the different connotations of the places. After pandemic crisis, the notion of redevelopment and enhancement of historic remote centres issues the need to focus policies on local tangible and intangible assets involved.
Conceived as drivers for triggering tailored-made sustainable development processes, these

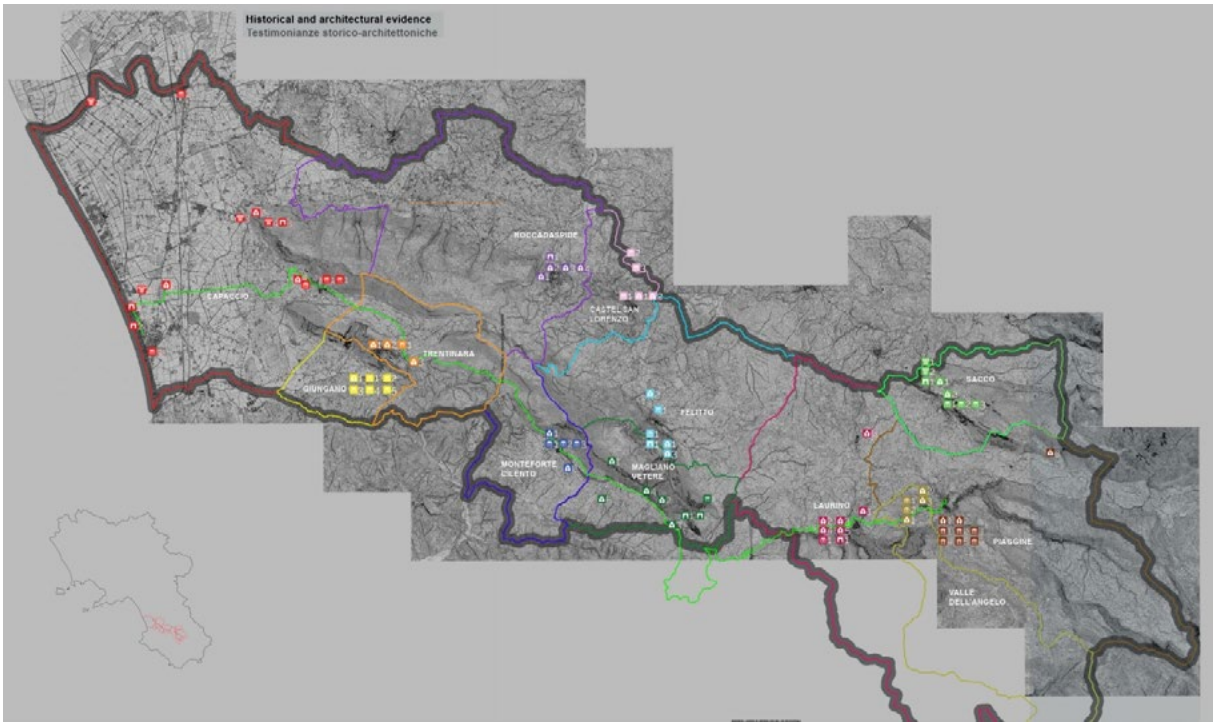

Fig. 2. Historical and architectural evidence

assumptions are evolving accordingly to the most recent European Union investment and policy instruments (EHS, 2021), revealing the updating methodological framework which are they based on (Maes et al., 2019).

The goal is to better integrate environment safeguard and cultural heritage preservation with sustainably developed economic revenue, involving high standard of increasing social cohesion (Colletta, 2017).

In this scenario, greenways are a leverage for prompting eco-friendly development paths; they are a methodological framework for addressing place-based approaches to planning design. A wide and globally disseminated literature in the field has shared this notion so far, combining interesting data worthy of a specific depth-in review, now inadequate to this report. Nevertheless, the adjective place-based deserves a brief explanation. What can be considered as the main relationship linking landscape, attractiveness and quality of life is, in fact, what is called a place-based policy and well-being, to which new instruments of planning and territorial re-balancing must be related to. This implies that landscape, natural resources, cultural heritage, traditional economies, crafts and costumes, along with local social and cultural milieu “stand out as important assets that may enable a place to be competitive in the global market, to be attractive and to improve quality of life” (Cerreta, Fusco Girard 2016, 489). Balancing these issues is the core-means to build up sustainable development processes and, hence, using greenways as tangible and intangible “knowledge paths” evidence how “heritage” can provide a productive lens to engage with contemporary issues, becoming itself driver of innovation and economic revamp.

4. Sustainable technological design for bio-cultural landscapes

Starting from the data of the National Observatory Sharing Mobility (promoted by MATTM, MIT and Foundation for Sustainable Development), which shows the growing demand for sustainable and shared micro-mobility, from the Mission 3 of PNRR which promotes, among other points, tourist cycleways of the National Network, and from PNR 2021-27 on cultural and creative enterprises to promote local development and global competitiveness, and by the National Strategy for Inland Areas (SNAI) for the protection and enhancement of bio-cultural landscapes (East et al, 2021), the research studied an Innovative Technological System to support Sustainable Mobility of inland areas outside the city, from the integrated design to the valuable features of the landscape contexts affected by slow tourism, through the construction of "equipped knowledge paths" that trigger virtuous mechanisms of revaluation of local economies. (Fabos&Ahern, 1995)

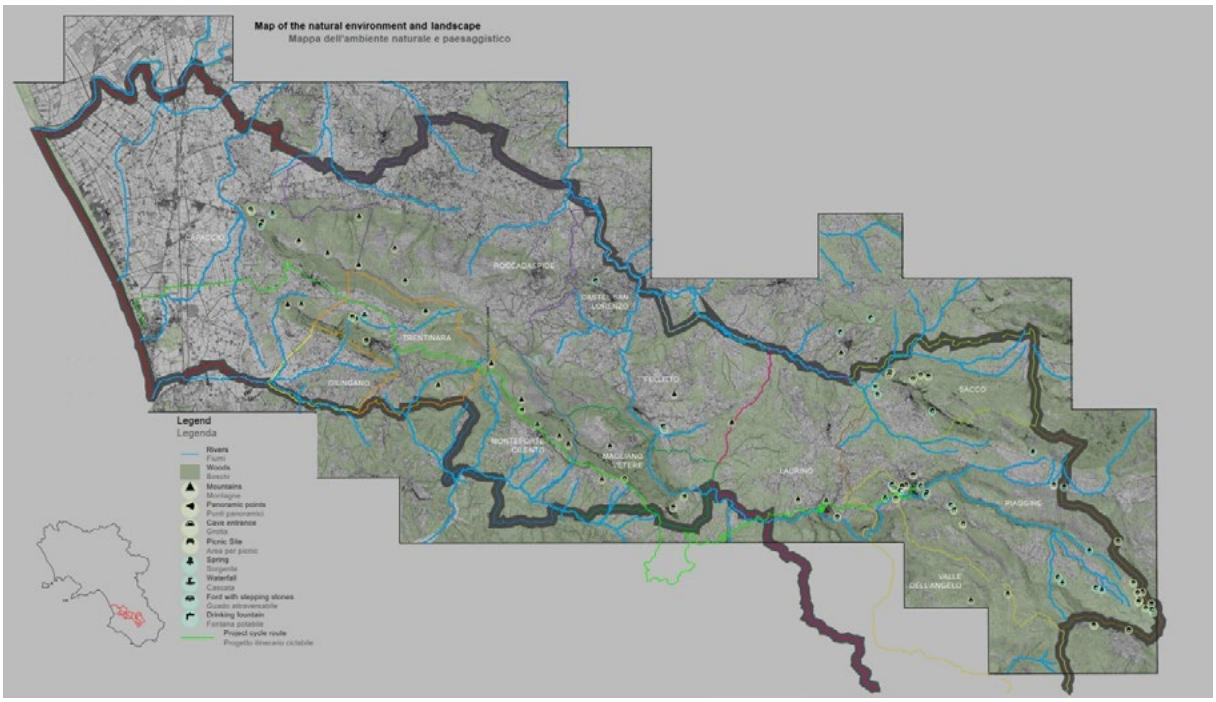

Fig. 3. Map of the natural environment and landscape

The network, if realized, will connect the main centres of social life and major tourist attractions with small towns and cultural and environmental heritage (Fig. 2) spread throughout the territory, through a network system that provides for the integrated and innovative design of a "service infrastructure" that integrates both the offer of assistance and the offer of cultural and tourist services, currently distributed unevenly throughout the territory (Fig. 3).
The research has focused on sustainable and inclusive services and equipment characterized by the use of materials and technologies that ensure the autonomy and compatibility with poorly populated areas for their inhospitable morphology. With the aim of capillarizing the new modes of mobility, that see in the electric power the main way of development, it started from the study of existing infrastructures and the related methods of adaptation to the new needs of users with particular attention to cyclists. The Municipality of Piaggine and neighbouring territories, in the National Park of Cilento Vallo di Diano and Alburni, are actively collaborating for the implementation of the project. In particular, Piaggine, considering the morphology that characterizes it and the recent entry into the Italian Federation of Environment and Bicycle (FIAB), has shown full interest in testing innovative services that would implement the new modes of mobility. The small municipalities already partially connected through the existing network of Via Silente aim at the consolidation of a network that favours the local social and economic development, which enhance the memory of places by triggering virtuous mechanisms of revaluation of local economies.

Acknowledgment

The contribution is part of an international research activities about “Green Ways. Wissensrouten und Netzwerke zwischen Orten mit besonderen regionalen, historischen und kulturellen Prägungen” (Project DAAD 2021) carried out by the Authors in the Research Group “The Memory of Sites. History and Preservation for promoting the environmental and architectonical heritage – MemoS”. Nevertheless, the paragraphs “1. Introduction” and “2. Methodological approaches to design a greenway net as a driver of a place-based sustainable development” are by E. Manzo; “3. Greenways for Cultural Heritage Preservation and Enhancement” is by M. D’Aprile; “4. Sustainable technological design for bio-cultural landscapes”. is by A. Violano.

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Conceptual framework for adaptive reuse of cisterns to cope with climate change and global warming: case of Safranbolu

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Abstract

Approximately 69% of global water resources are used for agricultural purposes, 19% by industry and 12% by residences (United Nations, 2014). Considering this situation, the management of water consumption and the protection of water resources in buildings that have a large share in water consumption on a global scale and in residences that constitute a large part of the building stock are very important in terms of ensuring a sustainable environment. With this study, it is aimed to find solutions to the problems such as rapid population growth, global warming, climate change and the rapid depletion of water resources caused by unconscious water use and the increase in water needs today. Within the scope of the study, especially the historical cities whose architectural texture is under protection will be discussed and it is aimed to find solutions to the problems mentioned and increase water efficiency by reuse the cisterns in these regions.

Keywords

Climate Change, Sustainability, Water Conservation, Adaptive Reuse, Cistern

1. Introduction

Because of the industrial revolution occurred at the beginning of the 19th century and the economic developments that followed, the population living in cities is increasing day by day. Increasing population in cities causes social, environmental, and economic problems such as uncontrolled and rapid consumption of natural resources, greenhouse gas emissions, global warming, deterioration of ecosystems, climate change, depletion of water resources, air-water pollution and high energy costs. One of the most important outcomes of these problems is the depletion of water resources due to climate change and therefore water stress that will occur in the near future.

The availability of water resources and access to these resources have been vital throughout human history Increasing water demand in parallel with population growth, climate change and global warming negatively affects the existence and quality of water resources and poses a danger to human life. Global water use has increased sixfold in the last century and continues to grow steadily at around 1% per year as a result of increasing population, economic development and changing consumption patterns (Development Report, 2020).

Today, even the most easily accessible water resources have become insufficient because of the impact of climate change and the uncontrolled use of water. The protection and effective use of water resources, which were not a concern in the past, make it inevitable today. It can be difficult to combat the negative effects of climate change, especially in historical cities where buildings and technology are old.

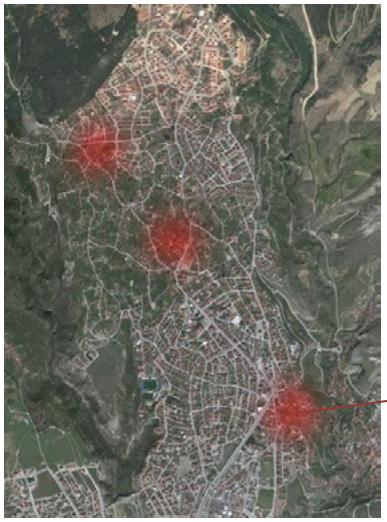

Fig 1a. Areas with dense cisterns in Safranbolu (2021) **Fig 1b.** The locations of the cisterns in the Atatürk and Barış Neighborhood in Safranbolu (2021)

2. Aim and Scope

The aim of this study is to seek solutions to problems such as the rapid depletion of water resources and increasing water demand because of climate change and unconscious water use in historical cities whose architectural and historical texture is under protection by reusing the cisterns which are already a forgotten architectural value in the region and to increase water efficiency.

With this study, potentials for adaptive reuse of cisterns to cope with global warming and climate change will be analysed.

Within the scope of this study, the effects of environmental problems in historical cities will be evaluated thorugh case of Safranbolu which is listed World cultural heritage list of UNESCO. It is a fact that there are many historical water structures in Safranbolu. Cisterns can be named of the structures. One of these historical water structures is the cisterns. Within the scope of this study, two neighborhoods where cisterns are located will be discussed.

3. Context

The historical city Safranbolu is located in northern Turkey, between 41-16 north latitudes and 32-41 east longitudes. The city of Safranbolu, which is on the UNESCO World Cultural Heritage List, has been used as a residential area for centuries and has managed to reach the present day by preserving its cultural and architectural heritage. It is known that in the historical city of Safranbolu, which consists of old wooden framed structures and narrow streets with cobblestone pavements, cisterns are densely located in the region where the Greeks lived in the past. This region is known as Atatürk and Barış Neighborhoods today. Within the scope of this study, the cisterns in the mentioned two neighborhoods will be discussed. Areas with dense cisterns in Safranbolu in [fig. 1a] and the locations of the cisterns in the Atatürk and Barış neighborhood that are determined as study areas in Safranbolu in [fig. 1b].

4. Literature Review

As a result of the literature research, it has been seen that the construction and use of cisterns dates back to the Neolithic Age. In this era, it is known that cisterns were built with waterproof plaster on the floors of houses in villages (Miller, 1980). In later ages, cisterns used for agricultural activities were not only used to store water, but also used as underground chambers, hiding places for fugitives, burial places and even prison cells (Mays et al., 2013). The most monumental examples of cisterns built in

various shapes and sizes since ancient times can be found in the Roman and Byzantine periods and in Anatolia, which has hosted many civilizations. These water tanks, which were built as open or closed, were used for the storage and resting of the water brought by waterways and aqueducts (Güngör, 2021 and Öziş et al, 2005).
In this study, it is aimed to re-function the cisterns within the scope of combating the effects of climate change. It is envisaged that the cisterns will be re-functionalized by adhering to their original state and function within the framework of international protection policies. In this context, international conservation policies related to the reuse of architectural heritage and resources related to this subject are reviewed in the literature.

A theoretical approach to adaptive reuse was first proposed in the 19th century by Eugène Emmanuel Viollet-le-Duc. According to Viollet-le-Duc, “The best way to preserve a building is to find a use for it and then meet the needs of that use so well that there is never any need to make further changes to the building” (Plevoets and Van Cleempoel, 2011).

There are many different approaches to refunctioning in the literature. In one of these approaches, reuse is considered as an application in which the building is kept alive and is preferred because it is economical, provides social benefits (Yung and Chan, 2012) and is an indicator of an ecological approach (Stas, 2007).

In another approach; ensured cultural continuity. According to Assmann, cultural continuity can be defined as the change of the identity of the society by adapting to the requirements of the period without losing its essence (Assmann, 2001).

There is a limited number of studies in the literature on the protection and improvement of cisterns. One of these works is the Buffalo Bayou Park Cistern. This structure, which has been used as a reservoir since 1926, was taken out of use because of the leaks. The 221 columned structure, which spans an area of approximately 10,000 square meters, has been strengthened and improved. And the cistern has been transformed into a public space that works with the park above it.

In the study titled "Improvement of simulating sub-daily hydrological impacts of rainwater harvesting for landscape irrigation with rain barrels/cisterns in the SWAT model" by Li et al. It is envisaged that it can be used to collect water (Li et al,2021).

In another study, *“Sustainable Water Management in the Tourism Economy: Linking the Mediterranean's Traditional Rainwater Cisterns to Modern Needs*” by Enriquez et al., it is aimed to restore the traditional cisterns on the island of Santorini and evaluate the feasibility of improving sustainability and water efficiency by collecting and storing rainwater in these cisterns. The result of the study was that the cisterns could be rehabilitated as decentralized storage reservoirs and integrated into the island's central water systems, or alternatively, they could serve as cultural spaces to communicate the importance of water to users (Enriquez et al., 2017).

As a result of the literature research, many studies were found on the conservation and improvement of the cisterns in historical buildings. However, no study has been found on the adaptive reuse of cisterns within the scope of combating the consequences of climate change and global warming, which are discussed within the scope of this study.

5. Method

Cisterns are used to collect and store water for urban use. Today, however, the cisterns are either abandoned or covered. With the developing technology over time, access to water at home has become quite easy and the use of cisterns has been abandoned over time.
The cisterns in the historical region will be identified and documented by fieldwork, and then the water consumption data in the living areas in the region will be determined. The water consumption data obtained will be compared with the capacities of the cisterns and it will be tried to determine how much of the water use in the region can be met by reusing the cisterns.Cisterns identified and usable in the

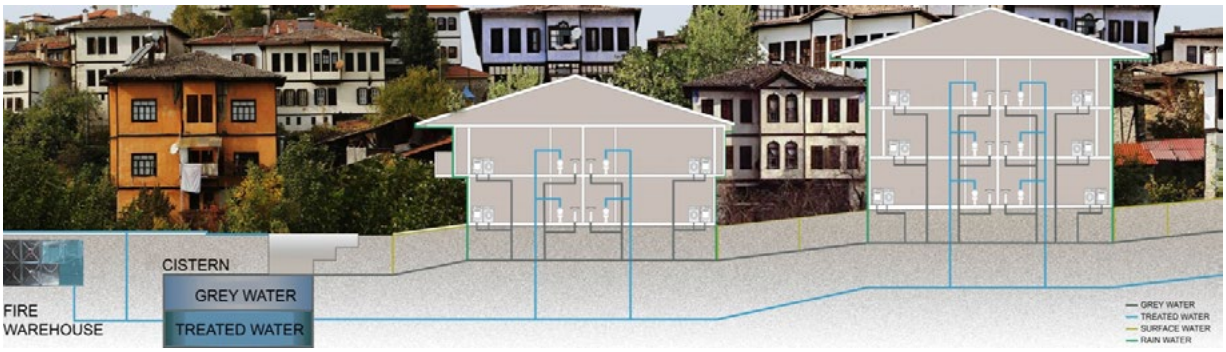

Fig 2. Analyzing the Adaptive Reuse of Cisterns on a Sample Section

area will be renewed and strengthened for adaptive reuse.
The cisterns should be renewed for adaptive reuse within the scope of nternational conservation policies and should be made suitable for gray water storage and treatment. In this context, the potential of the cisterns will be evaluated.
In the renovated cisterns, the grey water consumed in the wet areas of the buildings, household appliances such as washing machines and dishwashers, the wastewater collected from the roof of the buildings by rain harvesting, and the surface runoff water in the city will be stored in the existing cisterns. Then, the grey water stored here will be treated and recovered by the treatment systems integrated into the cisterns. Treated and recovered water will be pumped back to the buildings and used in toilet reservoirs, irrigation of urban green spaces and refurbishment of fire tanks. An example section on adaptive reuse of cisterns [Fig. 2].

With this study, it is tried to draw a theoretical conceptual framework for adaptive reuse of cisterns within the scope of combating climate change. In addition, the potential of cisterns in this regard is examined. Therefore, the methods and applications mentioned at this stage will be detailed later. Since the study includes the protection of a forgotten architectural work, it is foreseen to receive support from the necessary experts on this subject.

6. Discussion

This study has multiple potentials. The first of these is to combat the negative effects of climate change by adaptive reuse of cisterns. Another is that the cisterns, which are a forgotten architectural value, are brought to light and put into use again. The study also evaluates many potentials related to the use of recycled water, which is stored and treated in cisterns, in the region. One of them is its use in fire warehouses. Fire is a major concern, especially for cities with traditional timber-framed structures such as Safranbolu, and more fires are expected because of the climate change. In the old narrow city streets, it is foreseen that more water will be stored by using recycled water in fire brigade tanks where fire trucks cannot reach.

Another potential use is to try to prevent floods and droughts, which are the side effects of climate change, by storing runoff water. In addition, it will be possible to provide urban benefits by irrigating green areas in the city with treated water.

7. Conclusion

As a result, it is seen that the potential of adaptive reusing and applying cisterns is quite high in the context of combating the negative effects of climate change and global warming. In this context, it has been seen that this can be achieved by transferring the field studies to be carried out in the Safranbolu, visiting and detecting the cisterns and conducting the surveys to be applied to the users in the living areas in the region.

In this context, cisterns, which are already forgotten water structures in historical cities, constitute an important option to combat the negative effects of climate change without damaging the architectural texture of the region. In the study, in addition to combating climate change with the adaptive reuse of cisterns in historical cities, cisterns which are forgotten architectural values in historical cities, are brought to light by reusing them. In addition, it is aimed to ensure the continuity of urban water use and water efficiency by reusing the water obtained by recycling within the scope of the study in fire tanks, garden irrigation and buildings in the historical region.

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Patrick Geddes in Naples.
The beginning of his ecological thinking

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Abstract

The paper focuses on the years of Patrick Geddes' (1854-1832) training as a biologist and the research he carried out in Naples between 1879 and 1881 at the Zoological Station founded by Anton Dohrn in 1872. In those years, Geddes made a series of discoveries on the symbiosis between marine organisms that led him to formulate the theory of "reciprocal accommodation" in evolutionary terms, which formed the basis of his first scientific publications and laid the foundations for his urban and social ecological thinking. His exploration of the topic of symbiosis, central to the debate on the "struggle for survival", placed him in the context of a specific strand of studies on cooperation and mutual support that in fact made him one of the forerunners of ecological thinking. At the height of the Victorian era, his thinking joined that of other exponents and groups who, like him, opposed contemporary industrialisation and advocated different models of development and cities, not only in Britain.
The aim of the paper is precisely to trace these early scientific experiences in order to reconsider his ecological approach also based on his Neapolitan experience.

Keywords

Naples, Zoological Station "Anton Dohrn", Evolution, reciprocal accommodation, Symbiosis

1. Introduction

This paper focuses on the period of training as a biologist, which took place partly in Naples between 1879 and 1881, of Patrick Geddes (1854-1832), the well-known Scottish thinker, communicator, activist and planner, who was one of the founders of the urban studies. Needless to mention his Valley Section which marked the transition from CIAM to TEAM X, or the term "conurbation" he introduced, or the influence he had on Lewis Mumford who brought his thinking to America making him one of the founders of urban planning overseas (Mumford, 1950).
What is Geddes' ecology? While his aphorisms are famous: "From leaves we live", "think global, act local", less well known is his theory on "reciprocal accommodation", which, demonstrated under the microscope, served as the key to interpreting all social phenomena, and the basis for his subsequent thoughts and plans for neighborhoods and cities. This is not surprising considering the versatility of the author, who considered all human subjects interconnected: biology, economics, sociology, art, botany, even decoration, to which he also dedicated himself in the slums of Edinburgh with plants and gardens.
The theory of "reciprocal accommodation" was formulated precisely at the time the young biologist arrived in Naples at the Zoological Station founded by Anton Dohrn shortly before (1872), to devote himself to studies on "chlorophyll-containing animals".
This paper is a first contribution on this subject, which I approached relying on the correspondence I found in the Historical Archives of the Zoological Station between Geddes and Dohrn and his collaborators. Other sources are the scientific publications he produced in those years and the letters held at the National Library in Edinburgh from Geddes and his family during his stay in Naples.

2. The stay at the Zoological Station of Naples

After a short period at Cambridge, where he studied embryology, Geddes was recruited in 1876 as a demonstrator at the Royal School of Mines, where his mentor, the biologist Thomas Henry Huxley (1825-1925), taught. It was Huxley who, in 1877, awarded Geddes a scholarship to London's University College, where he met Charles Darwin (1809-1882), and who a year later encouraged him to carry out research on a particular species of marine worm "chlorophyll-containing" at Zoological Station in Roscoff (1872).

At the end of the 19th century, the so-called "chlorophyll-containing animals" were a much-discussed case among scientists and the subject of a long taxonomic dispute: were they plants or animals or yet another species? The most common belief was that the chlorophyll observed in many different invertebrate species was an endogenous product. In the early 1880s, this belief was challenged, thanks in part to the contribution of Geddes, who showed that chlorophyll was not produced by these organisms because it could be removed without harming its hosts (Sapp, 1994).

Soon afterwards the stay in Brittany, Geddes decided to move for a few months to Naples, to continue his research related to this topic at the Zoological Station directed by Anton Dohrn (1840-1909), built between 1872-73 on land belonging to the Villa Reale (Heuss, 2011; Florio, 2015). What made this research centre unique in Europe was the presence of an Aquarium on the ground floor of the building open to the public. Based on a design by the English engineer William Alford Lloyd (author of the Hamburg Aquarium in 1868 and the Cristal Palace Aquarium of London in 1871), it was inaugurated in August 1974 and immediately became an important source of funding for the institute (Groeben, 2010).

The Station became a compulsory stop for young biologists, including the young Scottish researcher who had the opportunity, under the agreement with the British Association signed between 1875 and 1814, to occupy from 26 February to 4 April 1879 and from 8 October to 14 November 1881 a so called "study table", as to say not only a desk, but also access to various bibliographic sources and above all the possibility of taking marine samples *in situ* and to study them (Dohrn, 1881, 1882).

In addition to his studies on the symbiosis between algae and micro-organisms, Geddes was sent by Huxley to Naples to draw inspiration from this renowned institution throughout Europe and to replicate it in Scotland. A few months after Geddes' arrival in Naples, indeed, on 7 August in the Stonehaven countryside 15 miles south of Aberdeen, was inaugurated the Marine Scottish Station of which Geddes became director (and of which he gave a detailed account in two articles in "The Scotsman" on 14th July and on 22nd September 1879) (Geddes, 1879a, 1879b,1879c).

However, his stay at the Dohrn Station was important above all from a scientific point of view, as can be seen from his publications from those years (Geddes, 1879d). In particular, he studied the nature and function of the yellow cells he observed in Naples in the marine protozoa known as *Radiolarians*, which Huxley called *Thallassicolla*, showing that the *filozoon* (the term Geddes coined for the yellow cells) and the cells of the *Radiolarians* were mutually beneficial.

In October 1881 he set out his theory of "reciprocal accommodation" in a paper entitled "Symbiosis of Algae and Animals" which was first read at Edinburgh University Medical School and then published in "Nature" a year later. The conclusion summarises its scope:

> For a vegetable cell no more ideal existence can be imagined tan that within the body of an animal cell of sufficient active vitality to manure it with carbonic and nitrogen waste, yet of sufficient transparency to allow the free entrance of the necessary light. And conversely, for an animal cell there can be no more ideal existence that to contain a vegetable cell, constantly removing is waste products supplying it with oxygen and starch and being digestible after death. […] In short, we have here the relation of the animal and the vegetable world reduced to the simplest and closest conceivable form. It must be by this time sufficiently obvious that this remarkable association of plant and animal is by no means to be termed a case of parasitism. If so, the animals so infested would be weakened, whereas their exceptional success in the struggle for existence is evident (Geddes, 1882).

3. The theory of “reciprocal accommodation” and its urban implications

His studies on the symbiotic relationships observed in marine organisms characterised by an ecology based on “reciprocal accommodation” were the basis for interpreting other types of relationships as well, including those between humans in the city, even the poorest one considered in Victorian age, in the middle of the race of the capitalism, as parasite (Samyn, 2020). Moved to Edinburgh in 1880 to obtain the professorship in Botany (which he will win in 1888 at the University College of Dundee), Geddes was among the founder in 1884 of the “Edinburgh Social Union” committed to restoring the homes of the most disadvantaged but also to their education. From these years onwards, Geddes began to openly take sides within the circle of thinkers who opposed progress because of the form it was taking in Britain at the height of the industrial revolution. In his book “Ruskin Economist” published in 1884 he formulated a political economy that was a synthesis of culture, science and the environment. In 1886 he married to Anna Morton with her he went to live to James's Court a slum in the city, which was rather run-down and infamous, and to which they devoted themselves with real to recovery micro-interventions to repopulate an abandoned neighbourhood and create what we today call *urban mixite*: an urban society composed from different populations. In their view, applying evolutionary principles to human society as it relates to the space in which it has settled, even considering the housing condition of the “parasite people”, contribute to the improvement of society, to which these generally marginalised people also contribute. Morton, his wife, had been working just before in London with Octavia Hill (1838-1912), as well as with Henrietta Barnett (1851-1936), both of whom worked to improve the housing conditions of the poor people (Whelan, 1998). Many of the activities carried out by the Geddes were inspired by their legacy: micro-interventions carried out together with the inhabitants, in which the creation of public spaces and gardens played a fundamental role. Geddes dedicated himself to decoration, starting from window embellishments with plants and flowers (Ciacci, 2021). It is not surprising that Pëtr Alekseevič Kropotkin (1842-1921), who between 1890 and 1896 formulated the theory of “mutual aid”, at the heart of the principle of solidarity, along with the geographer Élisée Reclus (1830-1905) and the zoologist Éli Metchnikoff (1845-1916), visited the Geddes family in 1886 (Ferretti, 2016). Openly opposed to what was crystallising as “social Darwinism”, and thus to competition as an evolutionary factor, Kropotkin found himself perfectly aligned with Geddes’ ideas. In his text “Mutual aid: a factor in Evolution” published shortly afterwards (Kropotkin, 1902), the Russian prince had identified each point on an “evolutionary ladder” as the dominant motif of mutual aid as a factor of natural balance and progress between peoples. It was Kropotkin who introduced Reclus to the urban renewal projects the Geddes were carrying out and the French geographer is known to have attended the Edinburgh Summer School in 1893 and 1895 organized by Geddes, of which the Outlook Tower (1905) was a continuation (Meller, 1990, p.104). From his scientific discoveries and through these meetings, Geddes would increasingly outline his position based on “reciprocal accommodation” in an evolutionary sense, which would orient his approach as a scholar of urban phenomena. From this ecological perspective, indeed, he will write his most famous text “Cities in Evolution” (1915) and he will base his chair on Sociology in Bombay from 1920.

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Klampenborg: between local identity and territorial development. An example for Campania's spas

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Abstract

The phenomenon of thermalism, traditionally linked to the principle of "salus per aquam", has its roots in antiquity and since Roman times has given rise to complex architectures that have frequently left indelible marks on the territory. In addition to the best-known examples, the essay will focus on the experiences of Denmark, a region of Europe that has not yet been studied in this sense. In particular, the case of Klampenborg will be explored. Here, the presence of springs with curative properties has influenced the urban development of the entire area and is still a source of territorial regeneration in ecologically sustainable terms, also due to the greenway that crosses it, to the point that it can be considered a model for the spa towns in Campania. It is therefore hoped that Campania's spa towns will be able to follow the Danish example and play a leading role in a new phase of sustainable tourism, becoming resting places and main stops on green routes. These routes would make it possible to preserve local identity and enhance natural resources, as well as reconnect marginal and highly fragmented areas.

Keywords

SPA, Klampenborg, Kirsten Pils Kilde, Copenhagen, Strandvejen

1. Introduction

Throughout history, man has always managed to harmoniously combine natural and environmental resources in places where springs with healing properties have been found, thus creating a strong and deep-rooted identity with the territory. Not infrequently, springs were attributed a sacred value of connection with the innermost part of nature, because "a perpetual flow of water gushing from a rocky crevice contained within itself an incomprehensible mystery [...]. This sacredness found greater consensus and veneration the greater the well-being derived from its ritual use" (Caccioppoli, 1995, p 36). The role of the baths in Roman times as a therapeutic place, but also as a social and political meeting place for otium, is well known. The social importance of the baths contributed to the creation of imposing structures in the territory of the Empire, of which there are famous traces throughout Europe.
However, during the historical periods, thermalism — the practice of using hot or cold mineral waters for curative purposes, due to their particular therapeutic properties or new hygienic rules — and in general the phenomenon of *salus per aquam* experienced alternating fortunes, as did the exploitation of springs, the search for new aquifers and the construction of all the necessary facilities for the various types of therapies.
In the eighteenth century, spa towns once again became places of treatment, and between the mid-nineteenth and early twentieth centuries, changing ideas and expectations regarding hygiene and aesthetics led to the construction of modern facilities. Moreover, on the basis of new chemical-physical and physiopathological findings, as well as studies on the properties of mud, these facilities slowly began to change their role. From being primarily a place for body care, they became more and more a tourist attraction, a centre for vacations and encounters. This was the period when spa resorts became fashionable stays for the bourgeois elite in England and Germany. Ostend, Baden-Baden, Bath, Monte Carlo, to name but a few of the most famous. In this contribution, another experience will be explored,

Dr. JOH. CHR. LANGE
Lære
om de
Naturlige Vande.
Samt
Grundig Undersøgning
af de Vande,
som findes udi Kiøbenhavn og dens Egne,
og til allehaande Nytte af dens Indbyggere
mest blive anvendte.
Næst Oplesning paa det Spørsmaal:
Hvilket Vand der er det bedste?
Miscuit utile dulci.
Kiøbenhavn, trykt hos L. H. Lillie, boende i store
Fiol-Stræde i den forgyldte Ørk. 1756.

Fig.1. Frontispiece, (Johan Christian Lange, Lære om de naturlige Vande,1756).

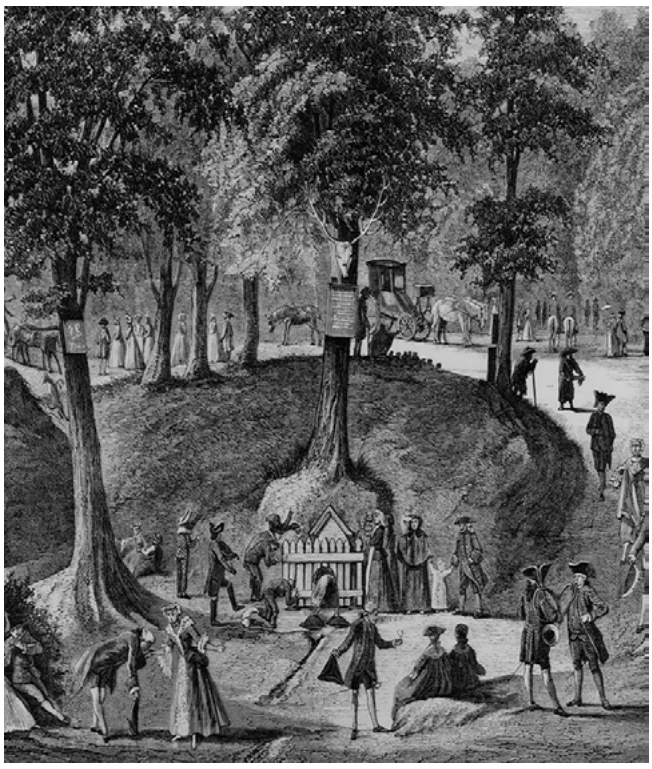

Fig.2. Kirsten Piils Kilde (B. Olsen, Kirsten Piils Kilde, 1874).

that of the Danish town of Klampenborg, which is certainly less well-known. From the end of the 18th century onwards, thanks to the presence of a number of water springs with curative properties, a series of transformations began to take place in this suburb - including the construction of a heliohydrotherapy plant - which determined its deep-rooted territorial identity.
Even today, the city remains one of Denmark's major tourist centres, thanks also to the greenway that intercepts it and makes it easily accessible.
Therefore, the contribution wants to underline how the phenomenon of *salus per aquam* has determined the historical and urban development of Klampenborg. In addition, the Danish case is proposed as an example of sustainable tourism to which the Campania spa sector should strive.

2. The salus per aquam phenomenon and the urban genesis of Klampenborg

In the 18th century, the small town of Klampenborg became a favourite hunting ground for Danish King Christian VI. Fascinated by the luxuriant nature of the place, the presence of water sources and the richness of the fauna, he decided in 1734 to have the royal architect Lauritz de Thurah build a baroque palace in the park of Dyrhaven.
Only two years earlier, in 1732, an ancient spring had been found in the same area: the Kirsten Pil Kilde, which had been frequented by sick people since the end of the 16th century and then fell into total oblivion. The spring regained prestige when in 1756 the naturalist Johan Christian Lange compiled a survey of the sources and healing properties of Sjælland's waters. The survey resulted in a work entitled *Lære om de naturlige Vande* [Fig. 1] in which Lange states that among other waters, the waters from Kirsten Pil Kilde [Fig. 2] are particularly good for cholerics, phlegmatics and children (Haugsted, 1993, p. 104). Therefore, a fountain was created that was soon visited by the sick, hoping to find a remedy for their ills through the consumption of water, and by the wealthy bourgeoisie in search of recreation. As a result, a number of different places of accommodation and amusement were created in the vicinity of the fountain, forming the nucleus of Denmark's first amusement park, which still exists today. At the

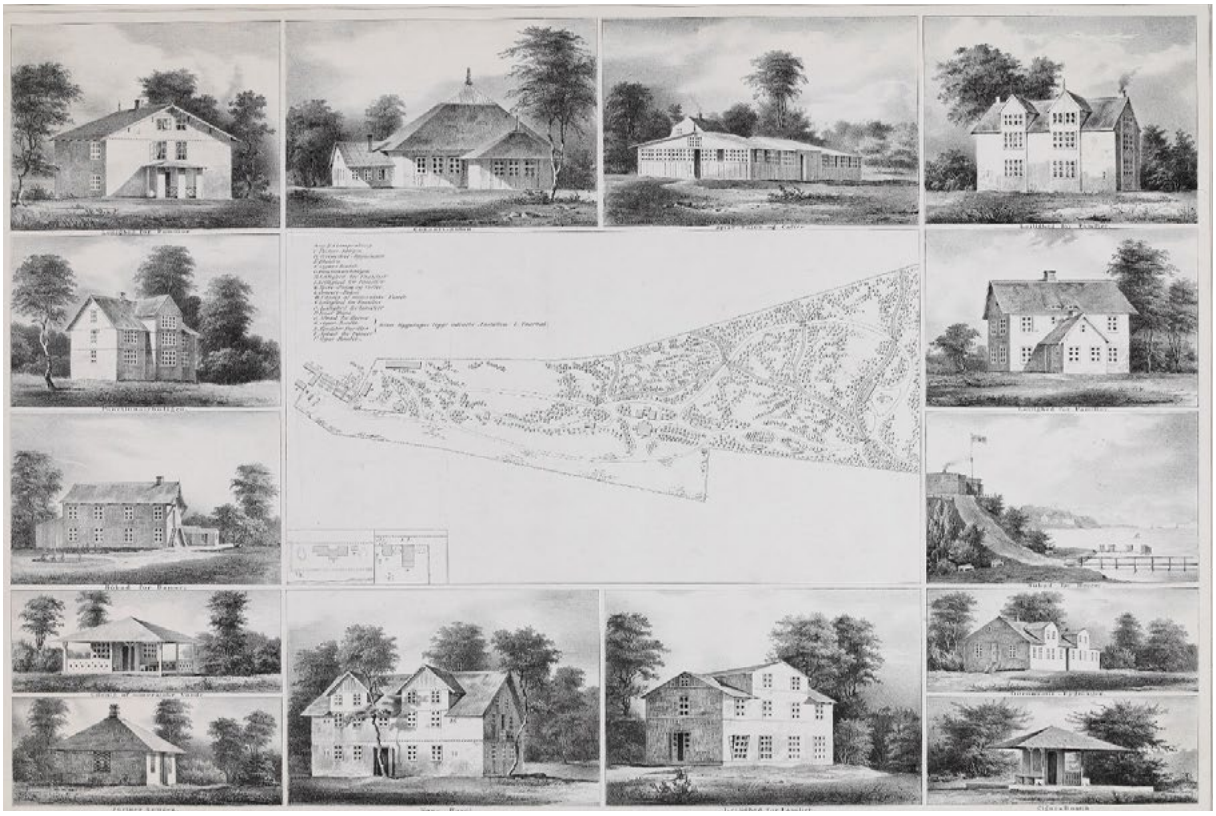

Fig.3. Klampenborg Spa (Em. Bærentzen, Vandkur- og søbadeanstalt ved Klampenborg, 1848).

same time, the wealthy Copenhagan aristocracy began to build elegant residences along the coastline where they could stay during the summer.

Thus, in the 19th century, the town became a fashionable resort, whose dual vocation as a health and pleasure resort made it seem particularly suitable for a modern hydrotherapy and bathing facility. The idea was promoted by the Danish army surgeon Jøn Jønsson Hjaltelin who, after visiting installations in Germany and the present-day Czech Republic, became convinced of the benefits of water cures. In 1842 he published the results of his research in a small pamphlet in which he demonstrated the importance of hydrotherapy and explained its beneficial effects on health. The surgeon suggested that in Klampenborg's future spa, cares would be provided by daily mineral water consumption and bathing in fresh and sea water by immersion in special tubs. The doctor also envisages cold showers as a remedy for patients suffering from arthritis and paralysis. Treatments are then combined with cycles of bandages in wet blankets and sheets. (Sebbelow, 1855, p. 31).

Once the state concession had been granted, the drawings were entrusted to the architect of the Thorvaldsens Museum, Gottlieb Bindesbøll, who, having the idea of creating a fusion between architecture and landscape, instead of building a single large hydrotherapy facility designed a series of small pavilions, including some in Tyrolean and Swiss style. The architect builds two separate complexes, one for men and a second for women, and in the centre of the park places a restaurant, a concert hall and a series of small buildings for entertainment, surrounded by nature, in a picturesque style (Thule Kristensen, 2013, pp. 238-255). The park is laid out by Rudolph Rothe, the royal gardener, according to the English garden model with a main avenue and several winding paths through the dense vegetation. The amenity of the landscape meant that the centre soon became not only a health resort but also a popular meeting place for the Danish upper classes.

In less than a century, Klampenborg was equipped with both ephemeral and permanent buildings for the enjoyment and entertainment of visitors, who came here especially during the summer season to drink from the fountains, but also to take advantage of the hydrotherapy treatments and spend time surrounded by nature.

The suburb, in addition to the construction of the Klampenborg Spa, has an important system of tree-lined avenues within large parks such as Dyrehaven. In addition, the small town is soon made easily accessible to the nearby Danish capital through the railway system.
Klampenborg demonstrates how, similar to the most famous European experiences, the *salus per aquam* phenomenon determined the development of tourism in the city and at the same time a strong territorial identity.

3. Strandvejen: sustainable development model for Campania's spa towns

Klampenborg retains its vocation as a place of recreation and a popular seaside resort. In fact, thanks to a wide range of leisure and nature attractions, such as the Kirsten piil Kilde, the Dyrehaven reserve or the coastline with its bathing establishments and the fine architecture of Arne Jacobsen, it remains one of Denmark's leading tourist destinations.
On the other hand, Klampenborg's good fortune is also due to state policies and the initiatives of private entities which, in recent years, have been concerned with promoting sustainable tourism, based on green mobility. In particular, for example, it is enough to remember how, over the last decade, the Danish government has set aside funds to intensify and strengthen the bicycle and pedestrian networks in order to connect the different cities and regions of Denmark, encouraging, on the one hand, slow, non-mass tourism that allows the local identity to be enhanced, and on the other, reducing pollution rates. As evidence of the wide-ranging debate and growing interest in these issues, one only has to cite the 2019 annual report of the *Danish Cycling Tourism Expert Group*, which states "More and more tourists are using bicycles on holiday and the number of those choosing to take long cycling holidays is increasing. At the same time, over the past two years, the Danish Road Administration has actively contributed to having the quality of the national cycle routes monitored, improved and developed." (https://www.vejdirektoratet.dk ' sites ' files ' 2019-09, p.5).
Klampenborg, therefore, due to its geographical location, remains an important tourist crossroads thanks to the national cycle path that allows the traveller in just under three hours to travel from Copenhagen to Helsingør without the use of a car or other means of transport.
The greenway that intercepts the suburb follows the route of the Strandvejen, an old road in 17th century cartography that was created to link the two commercial centres of Sjelland, Copenhagen and Helsingør. This route had already become an important axis during the 18th century, when it was used to travel from the capital to the countryside and coastal resorts, in particular to Klampenborg. In fact, "Copenhagen's wealthy aristocracy travelled along the Strandvejen and moved to residences along the coast to spend leisure time. Soon the less wealthy classes followed, and during the 19th century cottages, pubs and bathing establishments began to develop along the Strandvejen, which was very busy in summer" (Strandvejen i Trap Danmark på lex.dk. https://trap.lex.dk/Strandvejen]).
Today, thanks to the greenway, the tourist can see the picturesque landscapes of the Øresund strait and the coast of Sweden as he travels along the old route with its strong historical and architectural value. The traveller has the possibility to stop in Klampenborg to visit the conspicuous architectural and landscape heritage, continuing on to the Louisiana Museum, and continuing to the famous Hamlet Castle in Helsingør.
Thus, Strandvejen is undoubtedly an example of eco-sustainable tourism in which the focus has been on safeguarding local identity through the enhancement of the various historical-architectural emergencies and the conservation and regeneration of the territory thanks to the greenway.
In conclusion, the Danish experience is considered a best practice and it is hoped that it will become a model for the tourism sector, particularly the spa sector in Campania. It is therefore hoped that the cities and spas, due to their material and immaterial values, as in Klampenborg, will become the main places to stay, stop and meet for excursions based on green corridors, thanks to which marginal areas should be reconciled and the genius loci preserved.
Tourism policies should therefore draw on the Danish example and aim to reconnect spa resorts with small villages, which are often sadly isolated. The aim of reconnecting territories should be to enhance historical and architectural emergencies in order to preserve identity and generate economic growth. It is hoped that such policies can be implemented in towns in Campania with strong potential and distinctive historical, architectural, landscape and ethnographic features such as Contursi Terme, Telese Terme and Torre Annunziata.

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Vlorë, the ancient city of Albania and its history in Giuseppe Rosaccio's travel diary

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Abstract

In the pilgrims travel diaries and those who decided to face long crossings and several months of walking towards unexplored lands, it is evident how social and cultural changes emerge, witnesses of a universal history that replace over time. In numerous journeys that pilgrims faced over the centuries, Albania shows an extraordinary local, cultural and social history which, still a bit unexplored today, shows the signs of a civilization that wants to be known and studied as mush as the great European cities of the previous centuries. It is evident how the passage over the past ages, especially between the Middle Ages and the Renaissance, has affected the society of travelers in the eastern Mediterranean, influencing their culture and social dynamism.

Keywords

Travellers, Albania, Travel's diary, Valona, Adriatic Sea.

1. Introduction

Travelers, wanderers and curious people interested in getting to know human beings and society have always been considered expert guides in a world of cultures and customs. Scrupulous in noting everything that was shown to their eyes, they continuously allow us to analyze society as it was at the time, that still is an integral part of our current traditions. Each travel diary of a discrete importance has brought to light new concepts, stereotypes about national characters and testimonies of others lives through, and in a way that is more marked than the common historical sources, observations and notes capable of inducing the analysis of unexplored and unknown places. The story of a journey is an event that interacts with all the historical events and is fundamental to the understanding of both those relationships that have been established over time and the evolution as testimony of the past and certainty of the present.

2. Albania in Giuseppe Rosaccio's travel diary

The transition from the Middle Age to the Modern Era is marked by profound changes in all the fields of social, economic, religious, artistic and cultural life. In particular, society has remade itself, in a completely innovative way, more dynamic and brighter than it was in the previous decades. Europe finally emerges by finding the strength and the awareness to reveal a new society that will replace the medieval one and give birth to a new Renaissance civilization by broadening its horizons with great discoveries and extraordinary explorations. Therefore, although some of the traditional traits of the traveler have not disappeared as in the case of the pilgrim, the merchant or the student, the medieval traveler gradually transforms and takes on more modern features characterized by new political and cultural ideologies. All these enormous changes give a start to the Modern Era and mark profound transformations also in the phenomenons of both travel and pilgrimages that progressively change in all their forms compared to previous decades. [Paloscia F.1999].

Fig. 1. Valona, *Viaggio da Venezia a Costantinopoli* (Giuseppe Rosaccio, 1598).

Travelers who have crossed the Mediterranean Sea over the centuries have faced crossings and long journeys, pushed by the most varied social, cultural and religious reasons. Usually, travelers who had the intention of making it to the Holy Land described their journeys and their itineraries through the Adriatic Sea, the Balkans, the lands of Albania, Greece and the Middle East. In particular, Giuseppe Rosaccio in his *Viaggio da Venezia a Costantinopoli*, published for the first time in 1598 by Giacomo Franco, deals, through brief descriptions of *città, castelli, porti, golfi, isole, monti, fiumi e mari* ("cities, castles, ports, gulfs, islands, mountains, rivers and seas"), an itinerary of travel understandable and useful to *mercanti, marinari e studiosi di geografia* ("merchants, sailors and geography students"), as indicated in the title by the same author [Giuliano C., 2015]. In this work there are more than seventy tables in which coastal cities, rocky slopes and fortified islands are represented and followed by captions, short descriptions and various types of annotations written by the author aware of releasing a detailed and exhaustive representation to those who would have decided to undertake the journey starting from Venice and arriving in Constantinople. The Adriatic area, represented by Rosaccio, is particularly interesting; the travel diary includes views of the coastal cities of Albania such as the ancient city of Vlora, Durres and Shkodra. In the Rosaccio's itinerary, Albania is mentioned during the description of the city of Venice as part of that dominion of the *Serenissima* which, submitting all the provinces to its own empire, reached as far as Greece: *Nel qual tempo cominciossi a stendere il suo imperio nella Dalmazia e Albania, e in breve si sparse per tutta la Grecia; le quali Provincie alla sua obedienza ridussero* ("in that time, [it] began to extend its empire in Dalmatia and Albania, and soon spread throughout Greece; which Provinces [it] reduced to his obedience […]). Continuing the story, in particular towards the lands *Della Schiavonia, con sue città, & terre principali* (About Schiavonia, with its cities, & main lands), the author provides information about the ancient Asian people of the *Albans* who decided to settle in that region between *golfo di Venezia e i monti Camoli e Statei* (the Gulf of Venice and the Camoli and Statei mountains), particularly flourishing and prosperous because it was protected from the fury of the northern winds thanks to the surrounding mountains and yet *per essere da quella parte più piana, che in altro luogo* (to be on that side, flatter than in any other place). The Albans were expelled from the Tartars and decided to settle in that area to which they gave their name, they have, in Rosaccio's story their own language and they were a warrior and valiant people, as in fact described: *vagliono assai nella guerra, massime a cavallo, non si stancando mai, né lassando mai aver*

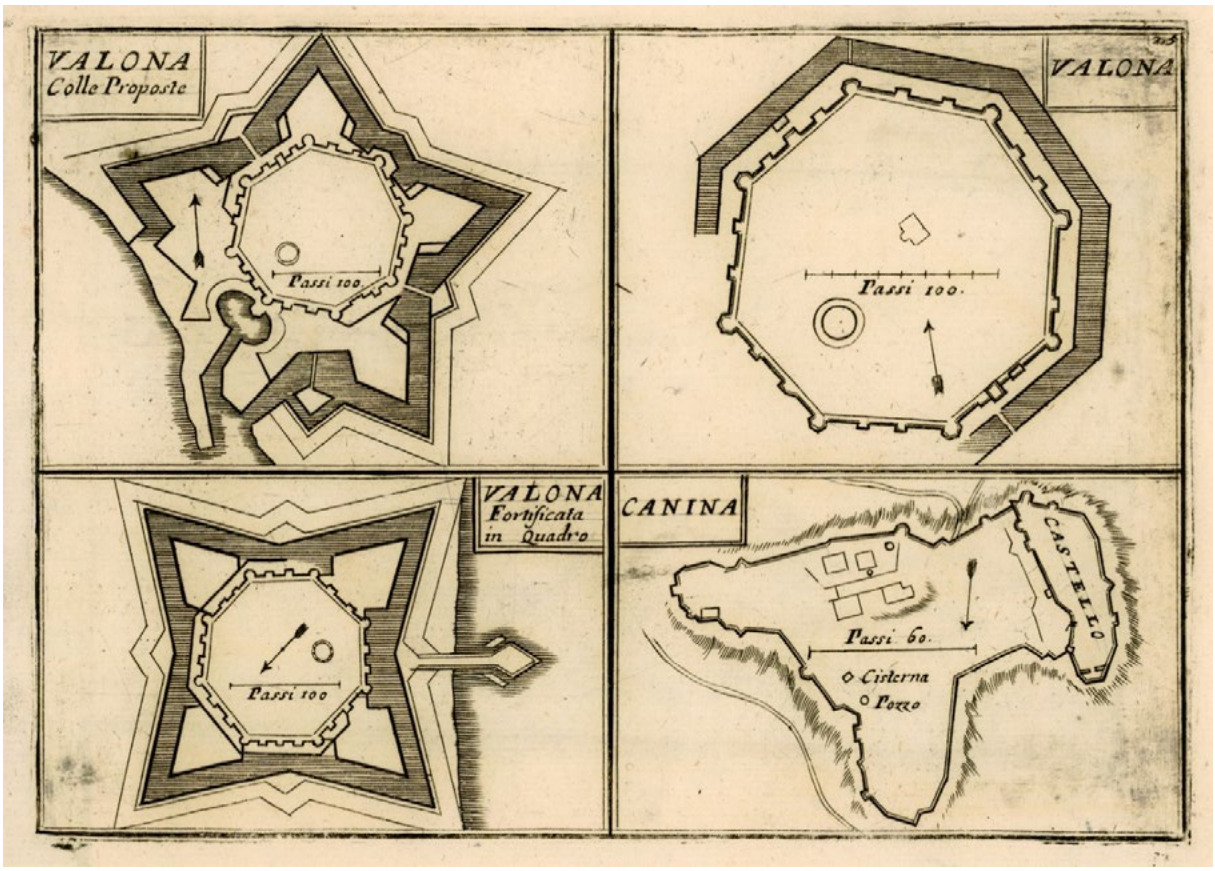

Fig. 2. Valona, *colle proposte fortificazioni* (Vincenzo Maria Coronelli, 1688)

quiete all'inimico, sacco mettendo ogni cosa, che se gli fa avanti, nella guerra, là ove gli è avvenuto molte volte, che si sono cagionati di molti disordini nelle giornate (they are very valuable in war, especially on horseback, never getting tired, nor ever giving peace to the enemy, sacking everything, and if in the war the adversaries got in front of them, they will cause much trouble during it, as it has happened many times), referring to the value demonstrated under the Scanderberg hero's leadership during the rebellion against the Albania occupation by the Turkish-Ottomans. Continuing his description of the Albanian lands, the author pays attention to some of the most important places of that time, especially the ancient city of Vlora [Fig.1].

Vlora's port, which is about *140 miglia* (140 miles) from Ulcinj and about *60 miglia* (60 miles) from the island of Corfu and together with Alesso, Durres and Croia, was amongst the most important places in the eastern Mediterranean. A very fertile and productive area, *Valona* became an economic center thanks to the copious production of wine, *degli quali gli abitanti ne sono molto ingordi* (of which the inhabitants are very greedy) and also for another item produced abundantly such as mountain salt, *che è la maggior mercanzia che in questo luogo si possa fare* (which is the largest commodity that can be found in this place). Valona is therefore one of the oldest cities in the entire territory of the Albanian region, founded in the sixth century BC. With the name of *Aulona* or *Avlona*, it is also present in the famous *Tabula Peuntigeriana* at a time when it was part of the Epirus region as an important bay of the Roman Empire. Therefore, witness of a great past, Valona can be found represented in various cartographies of the 16th and 17th centuries, in fact, even before Rosaccio's travelogue, the city is reproduced in a cartography by *Giovanni Francesco Camocio* of about 1574, where the characteristics of the place, like the coastal profiles and the inhabited center, are well defined. The image of Valona's landscape is also linked to another historical representation, from the abbot *Vincenzo Maria Coronelli* who in 1688 signaled the presence of a fortified citadel. In Coronelli's drawings, in addition to the classic

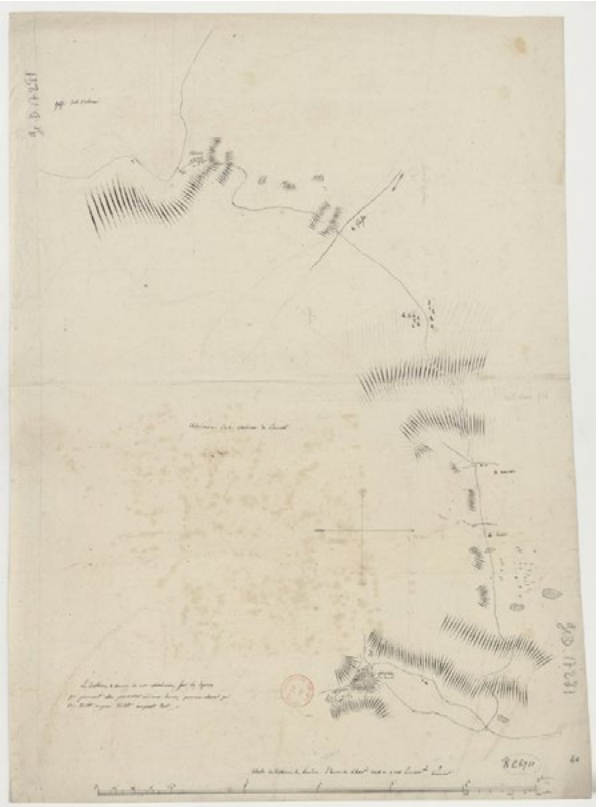

Fig 3. Il golfo di Valona (Giusto Emilio Alberghetti, 1690) **Fig 4**. *Itinéraire de la Valonne à Berati* (1818)

"bird's eye" view of the town from above, there are plan reproductions of the existing fortifications, their wall structures and a coastal view of the city [Fig. 2]. Another contemporary example is the map *Il Golfo della Valona* with part of the Canina dependencies, drawn up by *Giusto Emilio Alberghetti* in 1690, which contains a description of the town and the events that made it memorable. This map shows in detail the whole gulf of Valona, the inhabited areas, the mountains and the roads, in the corners there are representations in plan and in elevation of the fortifications with a metric scale in Italian miles. Surprising is the description of the events in the lower part of the map with the gulf's history and the latest conquests made in Albania by the very illustrious *Girolamo Cornaro* for the *Serenissima Repubblica di Venezia* in the seventeenth century [Fig. 3]. Finally, it is interesting to mention a map found at the Bibliothèque Nationale de France in the Department of Papers and Plants entitled *Itinéraire de la Valonne à Berati,* where a sort of itinerary is schematically represented along the Albanian coast starting from the Gulf of Valona and arriving to the city of Berat [Fig. 4].

3. Conclusion

There are many places in the travel diaries of pilgrims and many stories that tell the life and culture of the people who lived there. The documents of ancient cities, ports, fortresses and localities of the Adriatic itinerary testify the passage of travelers and culture lovers who, despite the difficulties in reaching their destinations, are distinguished by their dynamism and mobility and als represent significant history sources of places and architectures of a surprising Albanian history.

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New culture of mobility between flow of people and flow of ideas. Two examples of Metro's transformation: Naples and Copenhagen.

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Abstract

Through the comparison method, the research paper focuses on two recent projects of sustainable mobility, specifically the project of the Metro – Art in Naples and the Cityringen in Copenhagen. The case studies, both realized by AnsaldoBreda S.p.A., travel on parallel tracks on topics like the recovery of the urban fabric, respect for the past, and connection between the different metropolitan places. Instead, they lose their alignment at the intersection with the anthropological dimension. While the Naples Metro is characterized by a close connection with the world of art, Cityringen becomes an established reference at the world level as the concept of sustainability associates a more global and all-encompassing social-political action. A strategic planning, attentive to the protection of the natural and anthropic landscape, to be emulated to induce new automatisms and achieve a correct and conscious material culture of know-how.

Keywords

Architecture, Sustainability, Integration, Anthropology, Art.

1. Introduction

Starting from discovering the potentialities of the new industrial materials and their uses in the different fields of application, among which the transport system, mobility within urban areas has undergone remarkable changes. The definition of new road layouts and the strengthening of communication lines have been fundamental steps for designing contemporary cities and, above all, for the strategic planning of decentralization and expansion processes.

> "On the other hand, it should not be forgotten that railway architecture has immediately entered the sphere of collective imagination since it irrupted in the urban scenarios of the 19th century. Think of the giant metal flowers that sprouted from the underground of Paris, designed by Hector Guimard to indicate to the crowd and *flâneurs* the underground stations of the Metro, or the 38 stations of the Untergrundbahn in Vienna designed in just six years (between 1894 and 1901) by Otto Wagner as emblems of the *Moderne Architektur*" (Gravagnuolo, 2011, p. 4).

In this sense, the theme of connection between different city areas intersects with social, anthropological, and environmental issues. Beyond the formal question, it is demonstrated how much the issue of the metro line represents an important indicator of the degree of development, education, and well-being of society. It is no accident that the most avant-garde cities boast a sustainable, efficient, and integrated mobility system in logistical terms but, above all, in anthropological's ones.
By analyzing these two cases, we intend to demonstrate how the culture and the education on the theme of mobility are characteristic in the redesign of portions of the city and act on a wide range of local culture, representing a real chance for the entire community.

Fig. 1. Àlvaro Siza, Eduardo Souto de Moura, *Municipio station excavations*, Naples Metro (Federica Fiorillo, 2022).

2. Metro – Art of Naples

It's important to remember that the Campania region boasts several records in rail transport. Examples are the first railway line, the Naples - Portici section inaugurated by King Ferdinand II of Bourbon on October 3, 1839, and the Cumana Naples - Pozzuoli - Torregaveta (1889), the second subway railway in the world after London's one. "With the construction of the railway station of Mergellina and the section of the Direttissima Napoli - Roma, with stops beyond the hill in the stations of Napoli - Campi Flegrei and Bagnoli [...] the section mentioned above functioned as a city subway" (De Fusco, 1971, p. 317). What is said confirms how the redesign of the subway line reflects the natural vocation of the place. Born in 1993 to make up for the inefficiency of the two funiculars as the only means of connection between the city center and the Vomero hill, it was transformed into *Metro - Art* Naples by the intuition of the art critic Achille Bonito Oliva.
Intending to spread the concept of *quality* and shed light on a moment of economic-ethical-social crisis, the Metro has written a thriving chapter of urban experimentation, architecture, and, at the same time, urban archaeology. The excavations have brought to light numerous archaeological finds of considerable importance. It was so possible to update the archaeological map of ancient Naples that the Superintendence had published in 1985. Among the most emblematic findings, there was the Sanctuary of the Neapoli Olympic Games like the finds in Piazza Nicola Amore, the port of the classical age in Piazza Municipio, and the district near Castelnuovo [fig.1].
On the one hand, therefore, we turn to the past, and on the other one, we communicate with contemporaneity. "Thanks to the subway, the historical city has also opened up to contemporary

Fig. 2. KHR A/S studio, *Lergravsparken station*, Copenhagen Metro (Elena Manzo, 2004).

architecture: a new concept of reading the stations - no longer the homologating and representative one - as in the best examples of the beginning of the century in Vienna by Wagner or the cases of Franco Albini's stations in Milan, built in the '50s. A real sample that represents in a widespread way the heterogeneity of the current architectural languages" (Castagnaro, 2011, p. 2).
Like a time machine connecting past and future, the subway plays an unprecedented role and responds to a new social mission not only in terms of physical connection between the peripheral areas and the central areas but above all social. The stations enrich their primary vocation of a node of exchange so that the flows of people that cross them can give rise to flows of ideas, stimulated by what Achille Bonito Oliva defined as the "Obligatory Museum". An open-air museum that, with an ethical-aesthetic design approach, communicated in a frontal and democratic way the plural linguistic expressions of different art forms, attracting users from all over the world (Bonito Oliva, 2011). The case study becomes of considerable interest because it demonstrates how a sustainable mobility project can contain heterogeneous opportunities and represent an opportunity for rebirth for places and the people who live in them. Sustainable mobility becomes an opportunity for the rediscovery of material and immaterial values, for urban recovery of nearby contexts, for the promotion of art, culture, and civic sense, and also becomes an opportunity to educate beauty and raise awareness of environmental issues.

3. Cityringen, Metro of Copenhagen

It is not surprising that, about these themes, the supremacy belongs to Copenhagen. The city already after the Second World War, had demonstrated a natural vocation for the care of the landscape starting from the "*Five Fingers Plan*" (1947), passing through the "*Environment Protection Act*" (1973) up to the institution of the "*Danish Environmental Democracy*" (1999). "The general urban renewal of the nineties, which, as mentioned, involved above all Copenhagen, named European Capital of Culture in 1996, was the key to rethinking the road system and planning new and more modern infrastructure. The first

commitment in this sense [...] was the Copenhagen Metro project, which assumed a central significance in the government's environmental management policy" (Manzo, 2004, p. 100).
Emblematic is the sensitivity with which the project is connected with the urban tracks and, even more, with the Danish socio-cultural substrate atavistically unwilling to cross underground paths. Through the use of iron and glass pyramids, the KHR A/S studio, in collaboration with the Comet Consortium and AnsaldoBreda S.p.A, outlined a new user-friendly experience. The latter gradually accompanies the user towards the underground dimension, allowing him not to lose visual contact with the context above and especially with the natural light [fig. 2]. This paradigm inversion reached its peak in 2019 with the inauguration of the new section of the Metro called *Cityringen*. We want to highlight the values of which it has been a manifesto such as sustainability, livability, and collective involvement, quoting the mayor of the Danish capital Frank Jensen "A sustainable world starts with sustainable cities". As part of the broader design of the *Climate Plan 2025*, according to the city's purpose to achieve the goal of carbon neutrality, i. e. reduce to 0 CO2 emissions, the project was and still is, the most advanced system of sustainable mobility. In just eight years, Italian companies like AnsaldoBreda S.p.A. (today Hitachi Rail STS) and Webuild S.p.A. (formerly Salini Impregilo S.p.A.) realized the driverless metro made by a circular system that wraps around and around the city (Salini Impregilo, 2019). The ring, placed 30 meters underground, dialogues with the most significant architectural emergencies at different elevations and integrates perfectly with the pre-existing mobility system, acting as a driver towards the so-called proximity concept, the "Ville du quart d'huere" (Moreno, 2020).
For the *Cityringen* and the case of *Metro - Art* Naples, one of the most complex challenges is operating in highly urbanized areas with buildings of considerable historical and artistic importance. Emblematic in this sense is the excavation realized only 1.50 meters from the foundations of the historic Magasin du Nord and the one made under the eighteenth-century church Frederiks Kirke or Marmorkirken, an architectural emergency of great importance and symbol of the city. Another analogy between the two experiences is the relationship with urban archaeology. Although planned, unlike what happened in the case of Naples, in the preliminary phase between 2010 and 2013, a team of archaeologists has probed the project sites affected by the *Cityringen* as Gammel Strand, Kongens Nytorv, and Rådhuspladsen, bringing to light numerous traces of daily life. From ceramics to textiles, from ancient mills to the foundations of a fortress in the old port, the findings have created the most extensive excavation ever carried out in Northern Europe.
Finally, among the stations that *Cityringen* intercepts, Nørreport's one cannot be overlooked. The station as an integrated interchange node since the 2015 project by the studio Cobe, with its glass elements and projecting canopies, connotes a new public space. The latter takes its shape from the study of the routes preferred by pedestrians and cyclists, becoming a strategic point for mobility and especially sociality in the Danish capital. Also, in this study case, a new mobility system project becomes a precious opportunity to investigate the past, dialogue with the present, and, above all, plan a better future.
The Danish chapter is a winner for the historical attention to the *genius loci* of *Aaltiana*'s matrix and the transparent relationship between the institutions and the locals. Numerous promotion and awareness campaigns educate citizens to know-how and spontaneously induce a sustainable attitude whose center of gravity moves from the individual sphere to the collective dimension. All these actions are perfectly connected by cooperation and sharing services, of which mobility represents a significant integral part.

4. Final remarks

In line with this mission, the design must become a socially committed activity that seeks a new balance between user-centered dynamics and technological innovation and seeks a new path for economic development that cannot ignore the relationship with a new scale of values. "If the design is ecologically responsible, it is also revolutionary" (Papanek, 1973, p. 226). In the wake of the new funding programs of the structural funds and the new investments promoted by the European Commission destined for research and development of sustainable innovation, it's time to embrace a new culture of design. A design "capable of creating *artifacts* that are truly *made-to-art*: products born from attention to detail, from love for the life of things in their relationship with that of men and with the environment; expressions of ingenuity, creativity, and even human wisdom" (Manzini, 1990, p. 90). Learning from the Northern European lesson, we must hope that our cities will become a board of know-how and that the gap object of the study exists exclusively in geographic terms to be canceled entirely in the anthropological dimension.

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03 Restoration: a sustainable answer to uncontrolled urbanization

Restoration of the architectural heritage. The cemetery hill of Poggioreale in Naples

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Abstract

The importance of architectural restoration, in the wider context of urban and landscape design, lies in its ability to oppose, in practice and in theory, those practices of land and nature consumption which, in the recent past and in the present day, have been swallowed up by heterogeneous, fragmented and uncontrolled urbanisation. An emblematic case study is represented by the cemetery hill of Poggioreale in Naples, a landscape, urban and architectural context that presents, as a whole, complex and stratified problems defined first and foremost by stylistic and cultural interweavings that differ from one another; moreover, by structural and infrastructural emergencies that also have a considerable impact on the healthiness of the places; lastly, by conditions of abandonment, inaccessibility and degradation involving not only the various architectural, sculptural or pictorial typologies present on the site but also and above all the green heritage, both historical and spontaneous and semi-rural, present in the interstitial areas located between the various funerary enclosures that structure the system of hills to the east of Naples.

Keywords

Restoration, Park, architectural heritage, Poggioreale, Naples.

1. Introduction

The cemetery hill of Naples is defined as such starting from the first monumental architectural settlement, the Church of Santa Maria del Pianto. The church was built in 1658 to a design by Francesco Antonio Picchiatti to commemorate a tragic historical event that took place in 1528 when, on the orders of General Odetto Lautrec, commander of the French army besieging the city of Naples from the top of the Poggioreale hill, the city's water supply infrastructure was destroyed, causing a rampant plague epidemic that decimated not only the besieged but also the besiegers and their commander. The church of Santa Maria del Pianto, built as an eternal memorial to the French and Neapolitan victims, was a prominent monumental type on the hill of Poggioreale, which was then uninhabited, anticipating by one hundred and four years the construction of the first real Neapolitan funeral facility for the less affluent people of the Kingdom of Naples, the Cemetery of the 366 pits designed in 1762 by Ferdinando Fuga. Later, in 1837, the Sepolcreto dei Colerici was built, which, together with the Cemetery of the 366 pits opposite, constitutes the monumental funeral head of the Poggioreale cemetery hill. In 1839, Stefano Gasse southern entrance to the Monumental Cemetery was inaugurated, and work began on it in 1813 with the construction of the Chiostra Maggiore designed by Francesco Maresca. In 1865, a steep road with seven hairpin bends was built from Via Nuova del Campo to join the new hillside road with the church of Santa Maria del Pianto below, the axis supporting the cemetery of the same name. Twenty-four years later, in 1889, at the top of the Poggioreale hill, north-west of the Monumental Cemetery, the Cemetery of Pity was built to replace the “Old Cemetery”, the Cemetery of the 366 graves, to give a proper burial to the needy. The funeral mosaic of the Poggioreale cemetery hill is completed by the disused Cemetery of the English of Naples, whose entrance faces that of the adjacent Cemetery of

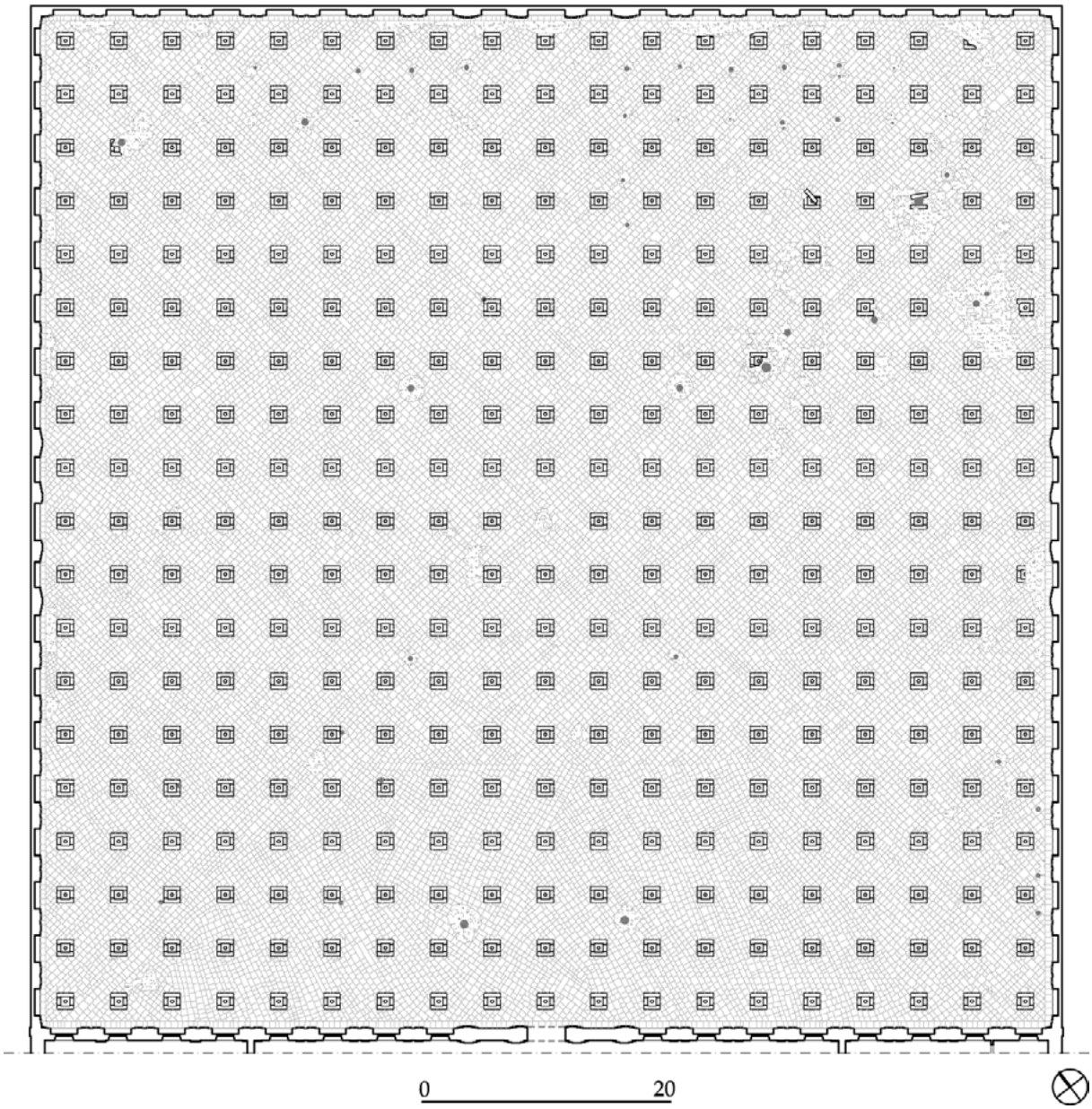

Fig 1. Cemetery of the 366 pits, inner courtyard, plan of the state of the art after the removal of tree vegetation.

Santa Maria del Pianto on the northern side of Via Nuova del Campo. As a whole, the Neapolitan cemetery system tells of an interesting cohabitation between architecture and nature: the romantic park of the Sepolcreto dei Colerici; the sinusoidal cypress-lined avenue of the Cemetery of Santa Maria del Pianto; the green context that characterises the Fondo Zevola as a continuation of the rural area that connects it to the west with the Sepolcreto dei Colerici and the dense tree vegetation that surrounds the enclosure of the illustrious men in the western sector of the Monumental Cemetery, tell of a vegetation context of great landscape impact: a conspicuous green area that is semi-abandoned and not used by the urban community. To underline the naturalistic importance of the Poggioreale cemetery hill it would suffice to describe the different botanical qualities, in terms of tree species, present in the Colerici burial ground, a romantic cemetery characterised by 'bean-shaped' flowerbeds and a looming presence of vegetation that overshadows the burial fields: hackberry trees, cypresses, plane trees, privets, holm

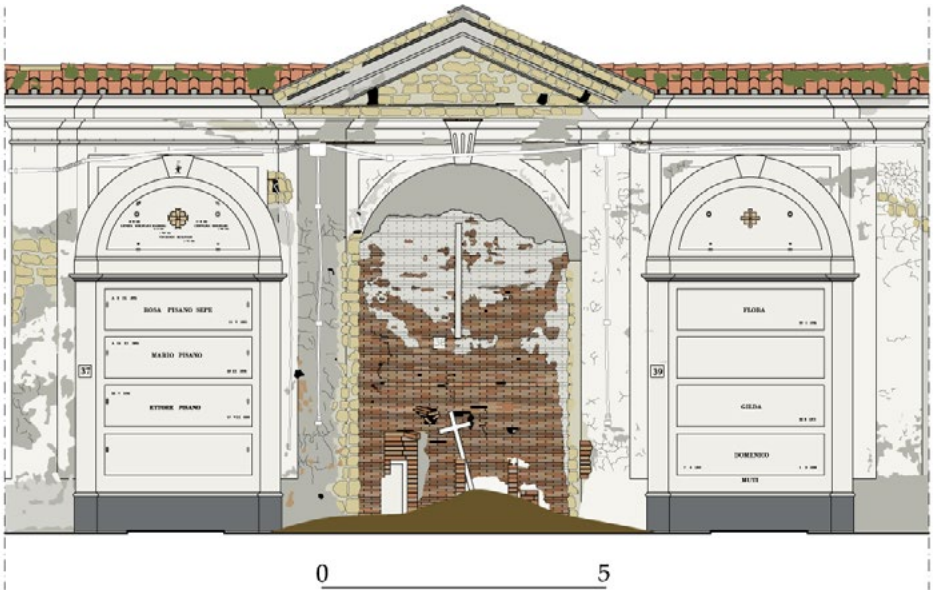

Fig 2. Cemetery of the 366 Graves, north elevation, detail, material painting.

oaks, black locust trees and magnolias: these are some of the thirty-three species of trees in the burial ground designed by Leonardo Laghezza, in an environmental dimension totally different from that of the Cemetery of the 366 graves in front of it, where there is no vegetation at all in the eighteenth-century burial ground.

2. The cemetery of the Archconfraternity of Santa Maria del Popolo agli Incurabili

The Cemetery of the 366 pits, built in 1762 by Ferdinando Fuga on behalf of the Archconfraternity of Santa Maria del Popolo agli Incurabili, marks the beginning of the cemetery infrastructure on the southern side of the hill of Poggioreale in Naples and represents, together with the Sepolcreto dei Colerici behind it, the monumental western end of the hill of Poggioreale. The Archconfraternity of Santa Maria del Popolo degli Incurabili was established in Naples after the foundation of the hospital of the same name, built at the behest of Maria Lorenza Longo in March 1522 on the hill of Sant'Aniello a Caponapoli, the northernmost tip of the founding nucleus of the Greek Neapolis. This complex architectural structure developed from the 16th to the 19th century through the annexation of various monumental buildings and the three churches of Santa Maria Succurre Miseris, Santa Maria del Popolo and Santa Maria delle Grazie. A veritable sanitary and religious acropolis perched on an overhanging tuffaceous bank, on the northern side, in the Arena dei Vergini below, an area of sedimentation of the main washers coming from the Arenella and Capodimonte hills behind. A tufa plateau that included, in the area below the monumental complex, a large cavity called the Piscina degli Incurabili, where the bodies of the guests who died in the historic hospital and those of the poor were deposited. The memory of this burial cavern is preserved in Filippo Ammanati's Gius Sagro, a volume written in 1793, where, in the paragraph dedicated to funerals and funerals, the author writes: “In order to protect against the infection, which can be feared from the air of this Capital due to the stench, which daily exhaled from the Pool, where the corpses of those who die in the hospital of the Incurabili were thrown, the King had the new Cemetery outside Naples, called Campo Santo, built. Disp. 18. Of the 1st day of May 1762. May 1762. in which year such an immense mass was built”. The “new Cimiterio” mentioned by Filippo Ammanati is the funeral structure designed by Ferdinando Fuga in 1762.

Fig 3. Cemetery of the 366 pits, inner courtyard, photo of the state of the art before the removal of the tree vegetation.

3. Degradation and the Restoration in the enhancement of the 366 Graves Cemetery

The rational architectural perfection achieved by Ferdinando Fuga in his project for the Cemetery of the 366 pits has been compromised over the last fifty years by extensions and modifications that have partially distorted its original uniqueness as a morphological type, and by material and structural degradation that has affected the monumental complex in its most representative parts: the main body of the building including the roof structure and the hypogeum below it, the perimeter wall of the inner courtyard and, finally, the latter's forecourt paved with Vesuvian paving stones. The first cognitive activities adopted a methodological approach divided into three operational phases corresponding to the historical and documentary analysis of the eighteenth-century building, its geometric survey, revisited instrumentally with respect to previous architectural survey campaigns and, finally, starting from the latter, an in-depth diagnostic investigation of the materials and related phenomena of degradation present on the site. As far as the most serious transformations suffered by the main building are concerned, these can be found on the external front in correspondence with the basement strip, where a series of skylights, built in the 1970s to provide overhead light to the hypogeum below, have disfigured the sober linguistic structure of the elevation in question. Not only that. On the western end of the main façade, an opening has been created with a reinforced concrete staircase that has transformed the last window in the façade into a door to the caretaker's house, which was originally accessed only from the entrance hall. Specifically, the damage was caused by kinetic mechanisms triggered by the excavation of the hillside downstream from the cemetery churchyard in the 1960s. The modification of the original hillside orography, replaced by a high reinforced concrete retaining wall, produced a slight rotation of the southern wall of the main building (first-mode out-of-plane mechanism), revealing a framework of cracks characterised by longitudinal lesions along the intrados of the vaults below the double-pitched roof, as well as the presence of vertical lesions at the structural intersections between the main walls and the internal partition walls orthogonal to them (second-mode in-plane mechanisms). As far as the enclosure of the inner courtyard is concerned, over the last fifty years, several speculative additions have affected the four sides of the cemetery courtyard: the valuable structural and decorative configuration of the enclosure wall, designed by Ferdinando Fuga with niches and double pilasters, has been cancelled out by the ill-advised introduction of niches, which, with their cladding slabs and relative lighting systems, have superimposed themselves on the original refined

architectural mouldings. The occupation of the decorative niches by modern niches has upset the original formal and stylistic balance of the inner courtyard. In addition to being transfigured by the inappropriate transformations described above, the courtyard has been infested by a large amount of spontaneous tree vegetation that has compromised not only the rarefied quality of the original space designed by Ferdinando Fuga but also, and above all, through the roots of the trees, the static stability of the pits below. To stop the structural and aesthetic degradation caused by the overbearing infestation of vegetation in the funeral court, an initial reclamation operation was carried out to eliminate all spontaneous vegetation. After about fifty years, this vegetation reclamation has restored the courtyard to its original visibility, as documented in Roberto Pane's photo published in the book Ferdinando Fuga, published in 1956. These guidelines for the restoration of the Cemetery of the 366 pits are part of a broader perspective that envisages the landscape, urban and architectural restoration of the urban area including not only the Albergo dei Poveri but also the Sepolcreto dei Colerici behind it and the Poggioreale funeral hill itself, which extends eastwards as far as the Monumental Cemetery.

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Restoration as a sustainable resource for urban regeneration. The case of the Forte di Vigliena

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Abstract

The topic of sustainability is nowadays increasingly current and relevant under different disciplinary fields. The heterogeneity of approaches and interdisciplinary are crucial to pursue the goals of the 2030 Agenda for Sustainable Development. The contribution, through the case study, tries to develop a critical reflection on the role of restoration in the process of enhancing the built and environmental heritage in highly degraded areas. The action starts from the acknowledgement of the value and can have repercussions on the built environment and social transformations. It is essential, for the definition of a sustainable and inclusive future, to give a new centrality, today, to areas marginalized from the main socio-cultural and economic flows, starting from the cultural heritage as a founding element for urban regeneration. "Reconciling conservation, sustainability and development is a precondition for achieving an improvement in the quality of life in environmentally and culturally sensitive places" (Carbonara, 2021 p.105).

Keywords

Restoration, Sustainability, Cultural Heritage, Cultural identity, Urban regeneration.

1. Introduction

Attention to the management and care of resources is fundamental, especially in the worrying environmental scenario of our times, which also jeopardizes the survival of humanity. The theme of sustainability, in its many facets, takes on a central role and represents the cardinal principle for writing a new beginning. As recently stated by Culture Minister Franceschini: "in a country like ours which has made the interweaving of landscape, architecture, art and beauty a feature of its identity and an element of strength, it is essential to preserve and enhance the extraordinary widespread heritage, from metropolitan cities to villages, through maintenance and targeted measures" (Franceschini, 2021). The will of the Council of the European Union is clearly defined in the document *on culture, high quality architecture and built environment as key elements of the New European Bauhaus initiative* (Council of the European Union, 2021). In particular are highlighted points 1 and 2 where the need to focus attention on *architecture* and the *built environment* clearly emerges. Both are signs of the anthropological process useful for identifying different ways of living and values, aimed at composing that cultural heritage able to shape our societies and identities. The built environment has always been a reflection of the community and it is the responsibility and duty of public administrations to preserve its quality, in close synergy with citizens. In this perspective, the Faro Convention already focused on the value of cultural heritage for the collectivity and encouraged the rising role of civil society in heritage governance (Council of Europe, 2005). The city has always been the concrete answer to immaterial values of a community, a place and a time (*ville* and *cité*) (Sennett, 2018). History teaches that it is possible to recognize oneself within forms and languages, characterized by relationships and spaces, signs of different eras. Works of high architectural quality, able to adapt to changing human conditions and become part of a new life. The contribution of architects who are interested in Cultural Heritage to respond to the many calls of our

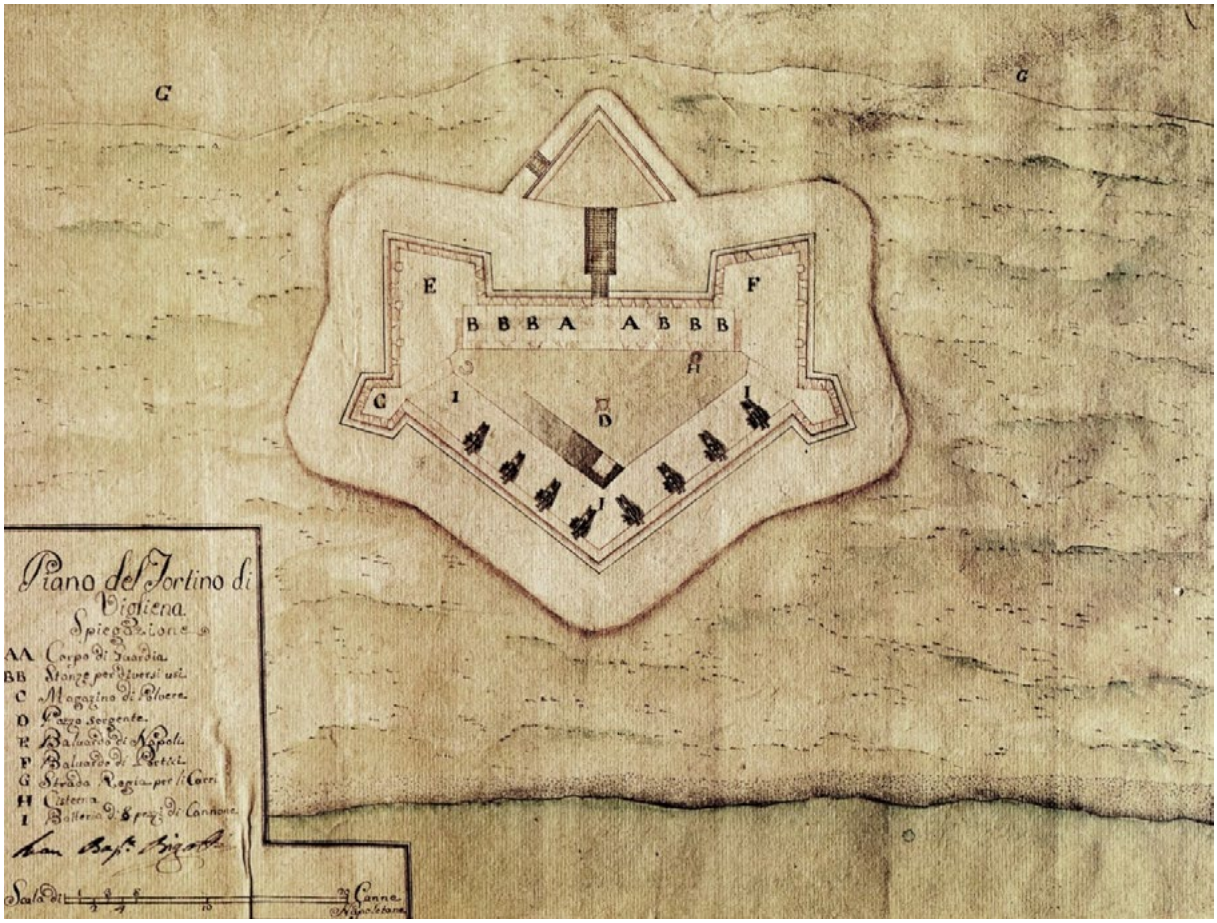

Fig 1. Plan of the *Forte di Vigliena*, Juan Baptista Bigotti, (State Archives, sala Plant, envelope 22, n. 3)

contemporary times is of considerable relevance. Firstly, in the awareness of the profound cultural and value crisis that has affected society and architecture, as a reflection of it, in recent decades and the need for a renewal of the philosophical thought and of the operational approach.
A renewal that in the palimpsest territory (Corboz, 1985) dense, rich in traces, stratifications can and must find an answer in the knowledge, enhancement and restoration of the cultural heritage. Firstly, for the preservation of the important testimonial value and the transmission to future generations. Secondly, for the recognition of the identity character which defines the sense of community and strengthens the belonging to a territory. In this scenario 1of new perspectives, attention is drawn to the role of the architect, in the development of the city, but above all in the development and care of the existing cultural heritage.

2. The *Forte di Vigliena* in the contemporary

The research and interest in the Forte di Vigliena began in 2021 with an action taken by private associations (R-EST-ART Vigliena!) in strong synergy with the Port Authority of Naples, holder of the property, aimed at its knowledge, valorization and safeguarding. (AA.VV. 2021) Given the impossibility of acting in the field, due to the ongoing pandemic, the initiative was aimed at analyzing, through preventive direct and indirect investigations, to report the state of oblivion and promoting the important role of the heritage for the collectivity and for the local community. Thanks to a 3D reconstruction of the fort, obtained with the aid of a drone through a process of aerophotogrammetry, it was possible to study, make it knowable and finally accessible, even if virtually, the small, monumental complex.

Fig 2 The remains of Forte di Vigliena, with overlay of Bigotti's plan, Corrado Castagnaro 2021.

In this regard, it is highlighted the positive and sustainable role of digital heritage in the process of knowledge, valorization and promotion of the good. An operation that, although apparently distant from the concrete action of restoration, represents a key element of the cognitive and subsequently transformative process. The Fort is located in the eastern part of the metropolitan city of Naples, on the edge of the consolidated historic city. The area, a former industrial zone, is certainly a potential driving force for the transformation and development of the Neapolitan city. A site that is unfortunately in a state of degradation and abandonment. In this difficult context, Forte di Vigliena is identified as a cornerstone to trigger a virtuous process of regeneration. It is located on the border between the area managed by the Port Authority and the railway tracks, which represent a real caesura: a boundary between the densely populated urban system of San Giovanni a Teduccio and the industrial area of the port. The Fort stands in a sort of limbo, a buffer zone, in the middle between the two areas, belonging neither to one nor to the other.

The Fort was built by order of the Spanish Viceroy Juan Manuel Fernandes Pacheco, Duke of Escalona and Marquis of Villena, at the beginning of the 18th century. The fort's architecture was accurately described in an article published in the magazine Napoli Nobilissima directed by Benedetto Croce, signed by the engineer Giuseppe Abatino (Abatino, 1899).

Originally, the layout was symmetrical with a pentagonal base and characterized by two watchtowers on the side: an introverted complex, a fort armed with cannons to defend the coast from attacks coming from the sea. The bastion was surrounded by a continuous moat and built with low walls. The structure was strategically placed and shaped so as not to be sighted and targeted by enemy ships. [fig.1].

It became a Monument of National Interest in 1891, following a proposal by the Neapolitan senator Matteo Imbriani. The fort's history is a troubled one; for further information, consult the presentation by Giuseppe Pignatelli Spinazzola for the Istituto Italiano dei Castelli.

Despite the important recognition it has been given, the monument is gradually being neglected. At the mercy of increasing degradation, it was slowly swallowed up by the factories that were beginning to settle in the San Giovanni a Teduccio area.

Today, despite the important material and immaterial value attributed to it by political and civil society, the Forte di Vigliena appears as an inaccessible ruin. The monument lies in carelessness and neglect, “set back from the line of the Stradone Vigliena, bordered by an anonymous fence, in an urban context

Fig 3 The anthropised context of Forte di Vigliena, Corrado Castagnaro 2021

which sees [...] heterogeneous warehouses prevailing around it, almost suffocating it and dominating its remains, without any form of distancing and respect" (Castagnaro, 2021 p.34). The remains and stones are overwhelmed by the presence of weedy vegetation which covers the traces, prevents them from being crossed and used, and limits the spatial perception. [fig.2]

The safeguarding and enhancement of tangible and intangible cultural resources is aimed both at better transmission to future generations and at improving the fruition and accessibility of places. "This heritage, as a whole, constitutes an essential element of civil society and civic identity" (Settis, 2002 p.20) and "the effectiveness of protection consists mainly in the ability to transmit to society the sense of belonging to a specific place" (Giusti, 2020 p.412). The condition of deep degradation in which it is located, opens up reflections on the loss of values of a testimonial monument important for the city, but especially for the eastern area of Naples. Although the charm of the ruin, in the history of mankind, (Picone, 2012) has raised an interest in those who observe it, we cannot afford to lose yet another important testimonial value. "The loss of memory [...] coincides with the substantial loss of identity" (Ferraris, 2014 p.245).

3. Conclusion

The focus on the Forte di Vigliena represents an opportunity to reflect bravely on the role of restoration in our contemporaneity (Agamben, 2008) as an opposition to waste and consumerism: in contrast, therefore, with the logic of late capitalism (Varagnoli, 2016). There is a need, today, to bring back the reflection on the centrality of the object, reducing the excess of subjectivism that has dominated and dominates the architectural culture, through the reference to the *new realism* (Ferraris, 2012). The challenge for Vigliena is to invest in the restoration of the factory, in the importance of the aggregating value of the historic-artistic heritage, as the lifeblood for defining a sense of community. It is a crucial element for rethinking the development and transformation of the eastern area of the city of Naples, to be put in a system with the various cases of industrial archaeology, the urban buildings at the back and the large University Campus of San Giovanni a Teduccio, to reconnect the urban fabric. [fig.3] The significant potential value of the area, in terms of culture, landscape and fascination due to the presence of various artifacts of industrial archaeology (for instance the former Cirio Corradini factory), can and

must be enhanced through measured interventions, capable of restoring dignity and decency to an important testimonial document. Transformations that aim to give a new centrality to areas marginalized from the main socio-cultural and economic flows, starting precisely from the architectural heritage and assigning to restoration the role of *cultural antidotum to the degradation of inaccessible architecture and urban places*.

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Recovery of the abandoned heritage towards new fruitive horizons: the case of S. Maria della Pace

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Abstract

The urban framework of the cities presents points of very high constructive density. In this frame of reference, the rarefactions constituted by the presence of urban parks or courts of monumental buildings is an effective response to the voracious consumption of land peculiar of the urban pattern. (Giordano, 2018) There are many sites that, for their included position, present through the intervention of restoration the opportunity to return to the community of the empty spaces. The contribution proposes the analysis of the monumental complex of Santa Maria della Pace and of the restoration strategies connected to it. The objective of the proposed strategies is to activate a process of architectural regeneration. The preservation of the complex involves the new use of a building of great cultural value and the revitalization of its interior spaces. The application of this strategy implies a necessary reverberation on the surrounding urban network, the recovery of the correct relationship between full and empty spaces, as well as the recuperation by the community of inhabitants and tourists of the heritage of cultural richness contained by the monument subject of this study.

Keywords

Restoration strategies, abandoned heritage, density, rarefactions, monumental complex.

1. Introduction

The compact city heavily alters the relationship between densities and rarefactions in the urban context. The study and the experimentations linked to this dichotomy were born during the 17th century when, as Benevolo reports, Le Notre established a laboratory for urban experimentation through the design and subsequent realization of the royal park of Versailles (Benevolo, 1991). This experience constitutes the search for the prototype of the shape of the eighteenth-century city. The process of analysis of spatial relationships is developed using forests and glades to obtain the simulation of urban full and empty spaces connected by radial networks of straight avenues that regulate and connect the pieces of the park that simulate the parts of the city.

This condition of strong unbalance in favor of density, affects two areas of the urban framework that have very different characteristics. The historical centers, places full of sites of high historical and artistic interest, have an obvious and elevated level of constructive density related to different layers of stratification. Similarly, but through typological and qualitative declinations diametrically opposed, in the suburbs the process of ground sealing has progressed exponentially since the second half of the twentieth century, stopping only once saturated the empty spaces between the different urban centers (Cassetti, 2012). Ancient center and periphery do not learn from the eighteenth-century experience and, even presenting characters of deep difference, show similar criticalities in terms of urban voids.

Going on with the analysis of the historical centers it is possible to notice how the context of high spatial compression has produced areas of private rarefaction such as internal courtyards, cloisters and gardens. Category of objects that reverses the relationship between occupied and free areas, developing the volume of buildings around areas spatially concluded and empty but with a strongly private vocation, intended for the almost exclusive use of those who occupy the building.

Fig 1. On the left: Santa Maria della Pace Monumental Complex, crossing of the church of Santa Maria della Pace, D. Crispino, 2019. On the right: extract of the *Mappa topografica della città di Napoli e de' suoi contorni* with site highlighting in red and original descriptive caption, G. Carafa Duke of Noja, 1775.

The building itself becomes the edge of the courtyard, the cloister or the garden, constituting a limit and an element of division between the rarefied interior and the dense urban context outside. The process of restoration of the rarefactions represented by gardens and cloisters contained in architectural heritage is an essential act for the recovery and reintegration of the abandoned heritage into the urban framework. (Giordano, 2021). The built heritage of the historic center is in a state of severe abandonment that constantly impoverishes the consistency and excludes both the local population and the tourist from the mechanisms of fruition of the same.

2. The monumental complex of Santa Maria della Pace

The studied site is in the ancient center of the city of Naples in the eastern part of the Hippodamian system. It occupies an *insula* along the final stretch of the Decumano Maggiore, today's Via dei Tribunali, between Via Duomo and Castel Capuano (Fig 1). It is placed among architectures of great value such as the Pio Monte della Misericordia complex and the Historical Archives of the Banco di Napoli. It occupies a privileged position along one of the most popular tourist routes of the city.
The settlement of Santa Maria della Pace is composed of four main architectural elements that are clear and distinctive in its typological-organizational structure: the church (Fig 1), the greater cloister, the minor cloister and the Lazzaretto Hall (Fig 2). The notable architectural value of its parts and the way they are composed, of evident Renaissance influence, gives to the whole complex a pleasant and singular eurhythmic order readable both in the planimetric and in the elevation development (Picone, 1990).

Fig 2. Monumental Complex of Santa Maria della pace, Lazaretto Hall. On the left: view of the hall from the center towards the altar and the medical cabinet. On the right: view of the hall from the altar toward the northern edge. D. Crispino, 2019.

The church, in the shape of a Latin cross, is surrounded by chapels and richly decorated, equipped with a sacristy that puts it in direct communication with the rest of the complex (Colonnesi, 1980) is today the only place in the city devoted to the practice of Orthodox liturgical ritual.
The adjacent double court building is based on ancient traces of walls emerging and visible in the eastern area of the basement of the central block. The two cloisters, placed at different heights, follow the natural slope towards the coastal part of the city, they differ both for the age of construction and for geometric regularity and highlight two separate construction phases of the building. Inside the eastern branch and along its complete linear development from the first level up to the roofs there is the Lazzaretto Hall, a single room of mighty dimensions, eighty meters long by a height and width of twelve meters, covered by a barrel vault, decorated and equipped with a double order of windows along the longer sides. This hall, which inspires astonishment in the observer because of its unique characteristics, was born as a leprosarium and during the centuries was converted into a hospital common room. Today it is occasionally used for civil ceremonies. The complex in its current state appears to be for the greater part abandoned after having hosted a branch of the court in the southern and western blocks of the south cloister. The remaining part, that is the central and northern branch houses the headquarters and administrative offices of the fourth municipality of Naples.

3. Restoration strategies

The restoration project focuses on two main strategic aspects, firstly the preservation of the monumental complex, as an asset of high cultural importance and also a holder of unique elements such as the Lazzaretto Hall, and secondly the possibility of reopening of the architecture to the community and to remove it from the state of neglect and abandonment in which it is currently located. Specifically, the project deals with the three levels of intervention of structural safety, conservation and architectural and system re-functionalization to restore the operating capacity of the building through the insertion of new

Fig 3. Monumental Complex of Santa Maria della pace. On the left: view of the entrance portal of the monumental complex. On the right above: view of the northern elevation of the main cloister. On the right below: detail view of the piperno balustrade. D. Crispino, 2019.

functions that allow new options for use. An aspect of great interest is the possibility of providing for the area of the old town the empty spaces of which there is a deep need. The architectural and urban nature of the ancient center of the city, as previously highlighted, derives largely from its highly compact and unitary structure as to appear a single dense artifact.
According to the restoration interventions on the building, an analysis of the static integrity of the building was carried out. Subsequently the processes of materic survey have been performed with consequent analysis of the degradation of materials to determine the state of conservation of internal and external surfaces. In accordance with the data obtained during the survey phases, it has been decided to provide a consolidation operation of the floors to minimize the risk of instability in the corners; different design choices were made for the decorative apparatus depending on the state of conservation of the surfaces. Inside the minor cloister, since traces of pictorial decorations covered by coats of white paint were found on the ground floor, an intervention of removal of the superficial layers has been planned to discover the decorative apparatus below. In the greater cloister, because of the massive presence of plaster detachments, the restoration has provided for the preservation of existing plasters and frames and the production of new plasters without decorative elements and made in undercuts in the portions affected by detachments. The materials used in this intervention are of similar formulation to the existing to allow the highest level of compatibility and integration between new inserts and existing elements. For all the stone surfaces, the restoration strategy provides for cleaning and conservation of artifacts in relation to their valuable manufacture (Fig 3).
The immediate perception is that the constructed system massively overlooks the voids that exist in the hidden way of the courtyards inside the buildings. The strategic aim of the restoration of the complex of

Santa Maria della Pace is to organically connect the free spaces of the internal cloisters to the system of urban public spaces defined by the decumanus - via dei Tribunali - by the vico Nuovo della Pace on the opposite side and by the lateral streets. To establish this connection greater importance was given to the secondary accesses and to the recovery of the relative portals to reconnect from a functional and visual viewpoint the two cloisters to the morphology of the public spaces of the city. For the same reasons, the restoration strategy hypothesizes the use of the rooms that perimeter the lowest level of the large cloister to configure for this space an internal square in direct connection with vico Nuovo della Pace and easily accessible and visually perceived in an immediate way even by those who access the complex from Via Tribunali.
The theme of recovery and reuse of empty spaces finds a further development in the design approach to the conversion of roof top surfaces into roof gardens, following the experience of the nearby MADRE Museum, designed by Alvaro Siza Vieira, where the roof terraces have been equipped as roof gardens in which the presence of contemporary art is well combined with re-naturalization.

4. Conclusion

The reconversion of the internal courts in passing squares as well as of the current covering floors in roof gardens configures living places and panoramic itineraries for culture, wellness and free time and extends the livability of the crowning terraces to the desirable parallel rediscovery, at the bottom, of the cryptic floors, interred and deeper that hide the history of the origins of the site and that can return to explain, through their rediscovered archaeologies, the urban and architectural history of the development of the ancient city. The line suggested strategy of reconfiguration of the complex aims at a new opening of the internal courts towards a plural and transversal fruition. The intervention object of this study stands as an emblematic case of transformation of the inner rarefactions of a historically private character in urban voids of declared public destination, contributing to the trend reversal that wants to restore the correct balance in the dichotomy of which are protagonists full and empty spaces of the urban framework. Finally, it is interesting to underline how the perception of the city's compressions experiences a deep change not as a result of morphological modifications, but through restoration interventions that preserve the heritage and introduce innovative fruition modalities.

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Harbour heritage protection: sustainable practices for the enhancement of the Balkan Coast

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Abstract

The contribution proposes some preliminary results drawn from the analysis and documentation of port areas along the Balkan coast. Port areas are sensitive, receptive and open systems that must be able to enhance endogenous cultural and environmental capacities. Aiming at the sustainable restoration of such areas means committing oneself to the valorization of the existing, in a perspective of respectful growth of environmental and natural resources. The action of restoration that affects the built environment is configured as an action of requalification of the existing, expanding the meaning of protection as an indispensable factor of defence not only of monuments, but also of the identity of the territory and its resources. With this in mind, the research aims to increase the attractiveness of the Balkan territory by triggering reflections on the conservation and enhancement of the built heritage, in order to protect that same architectural value handed down over the centuries by different cultures.

Keywords

knowledge, valorization, protection, sustainable recovery, Balkans

1. Introduction

In the period leading up to the 19th century, as is well known, many ports, in addition to being functional places for land-water exchange, were conceived as defensive places. Their characteristic as a space enclosed by well-defined and protected piers stems precisely from the main function that many ports had at the beginning of their existence, a character that is, expressly for defence (Bertocci, 2016,). The result that has come down to us today is still that of a certain closure towards the city, despite the tampering of later periods, in which many ports were deprived of their walls and the piers were often enlarged and simplified (Caroli, 2006). The importance of the sea and maritime transport, and consequently of port cities, is evident for a region such as the Balkans, which has unparalleled coastal development and extraordinary potential due to its characteristic and strategic geographic position as a bridge jutting into the Adriatic. On the other hand, the birth and establishment of the first large settlements and the most important civilizations of the past have traditionally been conditioned by the availability of access to the sea, either direct or guaranteed by the presence of navigable waterways. This demonstrates, as is well known, that the sea has always constituted a relevant, sometimes decisive, factor of development that can significantly influence the economy of a region both as a communication route, as a source of natural resources, as a driving force behind industrial activities, as a location for tourist activities and as an object of scientific research. (Timpano, 2004). In recent years, however, many of the virtualities that have made port areas centres of attraction and development of innumerable economic activities have tended to weaken or be less territorially bound to ports, with significant repercussions on the development prospects of the same areas, especially in less advanced countries (Timpano, 2004). The statement that sustainable development requires meeting present needs without jeopardising the future of those who will come after us echoes Ruskin's admonition that 'the earth is

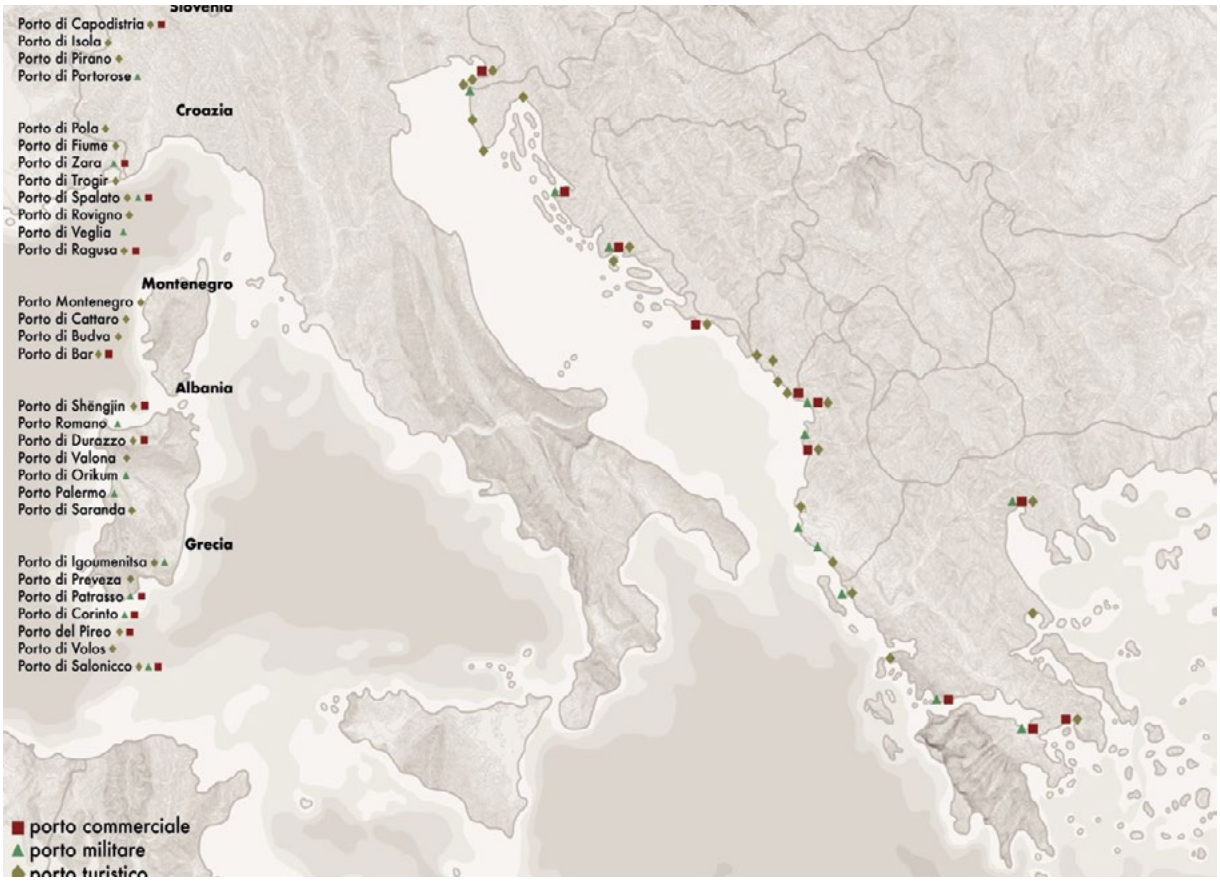

Fig 1. Balkan Coast: Synoptic Overview of the Specificities of Places, Balkan Coast, personal production.

given to us for our use so that we may pass it on to our children'. At the root of the desire to protect the built environment lies the conviction that the conscious and judicious use of resources, the care and repair of the built heritage, and continuous attention to the consequences of our actions is the best way to pursue the well-being of human settlements. The aim of the present work is precisely to elaborate, through precise mapping, the conditions of harbor facilities along the Balkan coast, to document their current shortcomings, and finally to propose, through the subsequent case study of Brijuni, an island in Croatia, adequate and feasible conditions of use that will enhance their present and future potential, determining the condition of protection in a stable manner over time.

2. Research objectives

The port is a place of transit, of connections, a demarcation of urban life which, due to the density of flows and functions, has seen its attractiveness and capacity for reception grow over time. It is a line that defines a strategic area in which the city is transformed into a landscape: the port infrastructure comes into being by following the natural morphology of the coastline and reshaping a space that is at the same time an access. It is a line that takes on an extraordinary value, a geometry of variable amplitude that defines the identity of the city, often reinforced by architectural elements (lighthouses, piers, warehouses, silos, customs) that have reinforced its role as a magnet (Russo, 2010). The port is therefore, landscape and public space. Its shape, its position, its history, its relationship with the coastline, its nature as a public space as an extension of the city on the water, define its character as a social and urban place, which has now become a closed enclosure of separation.

Fig 2. Croatia, Brijuni Island, abandoned harbour artefact, personal production.

The study focuses, with particular attention, on the analysis of the Balkan Ports, where port expansion continues without connections to cities and stands as an independent system expressing increasingly weaker forms of compatibility with the landscape and urban system. It is a study that, having become a prerequisite for the revitalization of the economy, highlights the need for greater development in port areas. In this context, the aim of the study is to describe and represent the abandoned port architectural heritage of Brijuni, a Croatian island, seeking to interpret, through restoration, a path of knowledge capable of triggering reflections on the conservation and enhancement of the built heritage, in order to protect that same architectural value handed down over the centuries by different cultures. Another reason for the study's interest is the possibilities that these places can create through their recovery, not only spatial and functional, but also an interpretative recovery, which will smooth out the divergences between the needs of contemporaneity and the individual forgotten structures. These places can

become new centres of creativity, helping small and medium-sized realities to achieve a new revival both economically and in terms of identity, even in a renewed version, but always linked to the specific themes present in the area. The opportunities for study that have been multiplying in recent years in the direction of this so-called minor heritage are confirming that the instrumentation with which research has been equipped is effectively aimed at a multidisciplinary approach as a priority form of risk prevention: this is even more evident for vernacular architecture, a heritage that is often difficult to investigate and consequently caught between the two extremes of oblivion and careless distortion (Picone, 2011). An archipelago made up of 14 small islands, Brijuni attracts a large number of visitors each year interested in enjoying the natural heritage of the place. Yet, the appearance presented at its entrance is not so pleasant, dotted with architecture in a complete state of disrepair. A contribution to the knowledge of this heritage seems all the more necessary because of the rapidity with which it is in danger of disappearing due to loss of function and degradation, but above all to initiate a reflection on the problems related to its valorization and protection. A protection conceived not only as a defence of what exists, but as a constant activity of knowledge, in fact, by appealing to that age-old culture of conservation that Salvatore Settis defines as "an essential datum of being Italian, which, like gestures and language, is transmitted and takes root without us realising it".

3. Applied Methodology

To achieve a satisfactory result, it is therefore right to determine the methodologies and methods of intervention in advance. The starting point of these methodologies is aimed above all at the sustainability of the methods and design choices being outlined. In this research, the methodologies of sustainability and contemporaneity come together, thus delineating intervention phases. In this regard, the existence of three-dimensional modellers capable of allowing the restitution of complex organisms and digital photogrammetry techniques capable of reconstructing the external appearance of the architectural organism have favoured the realization of this research. Such software has been of great support in that it has made it possible to encode, decode and archive the information acquired with the aim of sharing the data processed for the resolution of any problems of protection and enhancement, present and future, of the architectural artefacts analyzed. Starting from a methodological approach, we make use of the survey and the subsequent graphic processing activity through the use of digital software for the construction of two- and three-dimensional models. The use of image-based survey methods, i.e. based on the acquisition of images from which three-dimensional models of the surveyed area can be derived (Remondino & El-Hakim, 2006), has in recent years led to consolidated and effective procedures for the survey of large archaeological structures and sites. These techniques use the light in the environment to acquire photographic images, which are then processed to obtain 3D information about the area. The software used for the acquisition of these images was Agisoft Metashape Pro. The image concatenation operations are automated by the appropriate software during the return phase of the acquired data. During the image fusion process, the software also eliminates the perspective deformation present in the images due to the low altitude at which the images were taken. In addition, equipping the drone with an internal GPS allows it to detect the spatial position and location of the camera at the time the images were captured, so that the subsequently processed orthophotos are georeferenced. (Parrinello and Bertocci, 2017). The purpose of this applied methodology is therefore to not lose the documentary values of the architectural work by protecting and enhancing it. Only through an economic revitalisation of the artefact [...] in fact, quoting Stefano Musso's words, we have the answer to the problem. In fact, in this scenario, a possible reuse of the building has been elaborated, transforming it into a bicycle rental centre to allow tourists to enjoy the beauty of the entire island in a less tiring way. Through this approach, it is possible to formulate scenarios within which to evaluate options for decentralising certain parts or functions of the port system in an integrated vision of the territory and its components. Rethinking port-territory relations means working on different dimensions, linked to the way of tensioning strategies and projects for this infrastructure as part of the territory, that is, as a public space with a high landscape value (Russo, 2014).

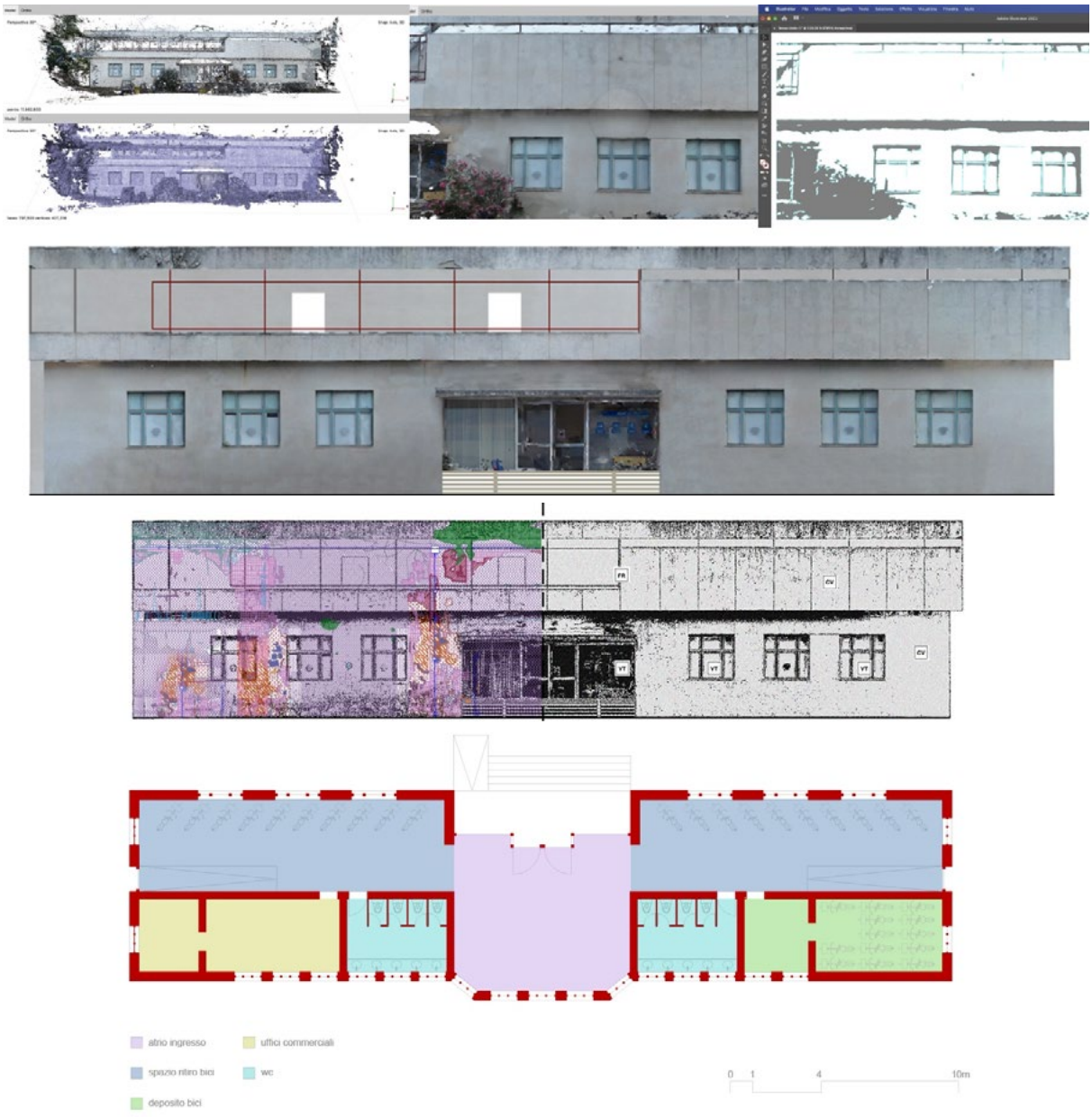

Fig 3. Croatia, Brijuni Island, abandoned harbour artefact. From top: Photogrammetric survey activities through the production of point clouds and subsequent vectorisation. Generation of the orthophoto of the south elevation with material and diagnostic investigation and subsequent restoration project, personal production.

8. Conclusion

In conclusion, this excursus defines the guidelines of a broader research path, proposing the cognitive analysis of port places and architecture. Carrying out in-depth research on the historicized fabric represents the first stage in the conservation of places. This study makes it possible to identify and relate the morphological, physical and natural characteristics of such a complex and stratified territory that defines the transition between land and water. The potential of research conducted through the use of widely tested methodologies where the discipline of restoration, in all its components, can provide descriptive and synthetic data and elaborations, offers the opportunity to explore new horizons for the knowledge and subsequent protection and valorization of the abandoned architectural heritage. Through

the proposed studies, the intention is to offer interpretative and operational tools capable of preventing and counteracting problems arising from valorization and conservation, in order to consolidate the collective knowledge of the architectural heritage. This mapping exercise offers the basis for subsequent research programmed aimed precisely at the protection and valorization of those areas that are no longer as marginal as they once were. This project tries to highlight the new themes of the contemporary architectural debate; a constructive and functional sustainability aimed at an ever decreasing consumption of soil, a rehabilitation of areas that are often undervalued, a punctual planning, defining different phases that go to create architectures, adequate to the real needs of the community, without neglecting the study of form and respecting the values of spatial quality.

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Abandoned heritage between restoration and valorisation: Mirine Early Christian Basilica in Croatia

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Abstract

Abandoned heritage, as is well known, constitutes a field of investigation of considerable interest for the restoration discipline. The present contribution, part of a wider research focused on the analysis of inaccessible and abandoned Balkan places of cult, proposes the study of the Early Christian Basilica in the Mirine-Fulfinum Archaeological Park on the Croatian island of Omisalj. This place of cult, dating from the Middle Ages, dominates the landscape of the site and is located to the west of the city's ancient Roman forum. Due to its cruciform plan, the complex is one of those sacred buildings in the shape of a Latin cross that were created by transposing the symbol of faith as the focus of the construction project. The research proposes the study of this place of cult with cognitive analyses aimed at the restoration and sustainable reuse of both the architectural spaces and the context of the abandoned heritage of high historical, architectural and cultural value.

Keywords

Abandoned religious heritage, Croatia, Knowledge, Restoration, Valorisation.

1. Introduction

In the field of interventions on abandoned historical buildings in order to guarantee a new life through a change of use, as is well known, it is necessary to know and respect the identity of the building. In a context where globalisation has often led to chaotic urban expansions to the detriment of built assets of high historical and cultural value, abandoned heritage can be considered as an important resource to be protected and enhanced (Iarrera, Lione, Minutoli, 2018). The practice of reusing historical buildings has developed over the centuries since late antiquity. Since the time of Vitruvius, around the second half of the first century BC, the concept of *utilitas* as a necessary condition for the existence of a building was widely spread (Gros, 1997). This theme was developed and strengthened in the 1980s through the contribution of various scholars, such as Settis (1984) who introduced the concept of memory and reuse of the ancient. In the field of abandoned religious artefacts, this practice has developed in different ways since the barbarian invasions. Following these events, many monastic and monastery complexes on Croatian territory underwent a series of modifications, mainly to adapt these structures to the new military requirements. In this context, the paper proposes the analysis of a former religious building located west of the ancient city of Mirine-Fulfinum in Croatia, with cognitive operations aimed at the restoration and sustainable reuse of abandoned architectural spaces. The research involved the development of different phases: firstly, an analysis of the sources found, in order to frame the historical and cultural context of the area under investigation; an analysis of the current state of conservation by means of the survey for restoration; the design of intervention strategies aimed at the restoration and sustainable reuse of the religious complex.

Fig 1. The Mirine Early Christian Basilica: photographic survey on the left; processing of point clouds and orthomosaics on the right (Adriana Trematerra, 2021)

2. Historical analysis

Some essays by the writer Tolomeo testify that the ancient Fulfinum city was built in the second half of the first century. At the time of Emperor Domitian, the site was inhabited by the Flavian dynasty and belonged to a complex of three cities, classified as *municipium civium romanorum* (Rendic, Miocevic, 1974).
The ancient town of Fulfinum is situated on a hill overlooking the bay of Sepen on the island of Omisalj, on a 400 x 800 metre plot of land. According to research conducted by the scholar Faber between 1974 and 1982, the area underwent extensive expansion through the construction of a Roman forum, several taverns, a basilica, several residential buildings and town villas.Today, some pre-existing structures can be seen in the eastern part of the settlement, including the remains of a thermal complex, some residential and commercial buildings, port facilities and the old early Christian basilica. Following the collapse of the Roman Empire, the northern Adriatic was affected by the arrival of new noble families as a result of a significant increase in population. As a result of these events, which probably took place around the 4th century, the old town of Fulfinum could not contain the growing population and was gradually abandoned. In place of the old town of Fulfinum, the new citadel of Myrine was built, between the 6th and 7th centuries. The latter consists of a large early Christian complex dominated by an ancient basilica considered the largest in the Mediterranean (Causevic, 2006). More recent studies, dating back to the 1920s, conducted by the scholar Szabo draw attention to the impressive ruins of the identified

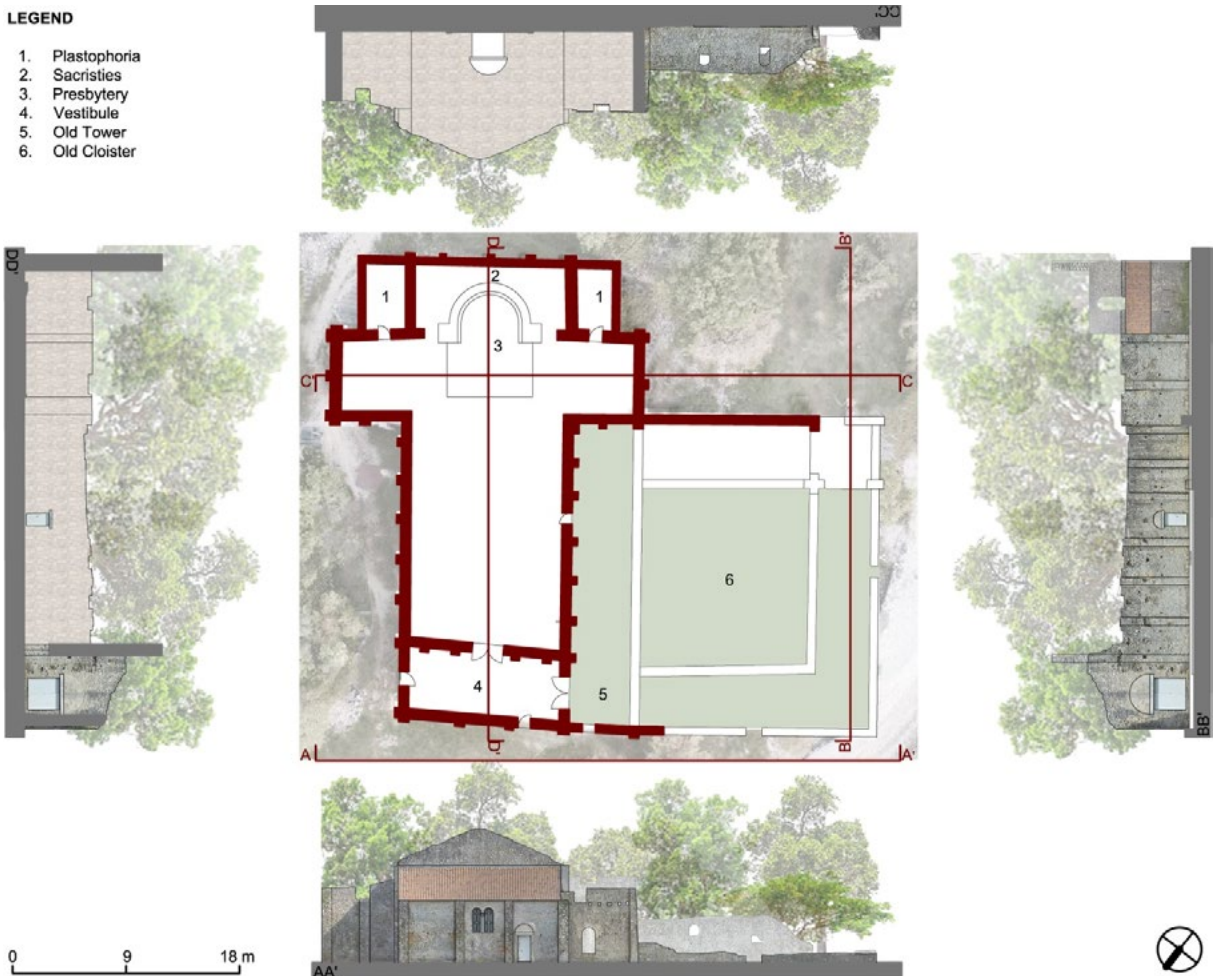

Fig 2. The Mirine Early Christian Basilica: geometric survey (Adriana Trematerra, 2022).

religious complex, located to the east of the ancient Roman city of Fulfinum (Szabo, 1930). The Basilica originally had no religious function and consisted of a single rectangular room measuring 12 x 28 metres, with a tower and portico to the south, in front of which was the residential and commercial part of the complex. Later, the building was transformed into a basilica, consisting of a cruciform plan with a sanctuary, sacristies, a transept, a narthex and a bell tower. Following the barbarian invasions, the basilica was repeatedly sacked and used as a military garrison until it was completely abandoned (Perini-Muratovi, Novak, Vyroubal, 2009).

The present early Christian basilica of Mirine consists of a cruciform plan with a single nave and different spaces: a vestibule, currently housing ancient underground tombs and a sarcophagus in perfect condition; two pastophoriae, located at the corners of the back part of the church; two sacristies facing a semicircular apse with altar and crypt; a presbytery, in ancient times raised above the level of the church; a tower, which, in addition to its defensive function, originally housed some sepulchres on the ground floor; a portico on the southern side; three new porticoes added later on to the pre-existing one and to the tower, which delimited an internal courtyard similar to a cloister. Internally, the choir of the church has a semicircular space, the entrance to which was probably through two arches placed laterally to a larger triumphal arch at the intersection of the nave and the choir.

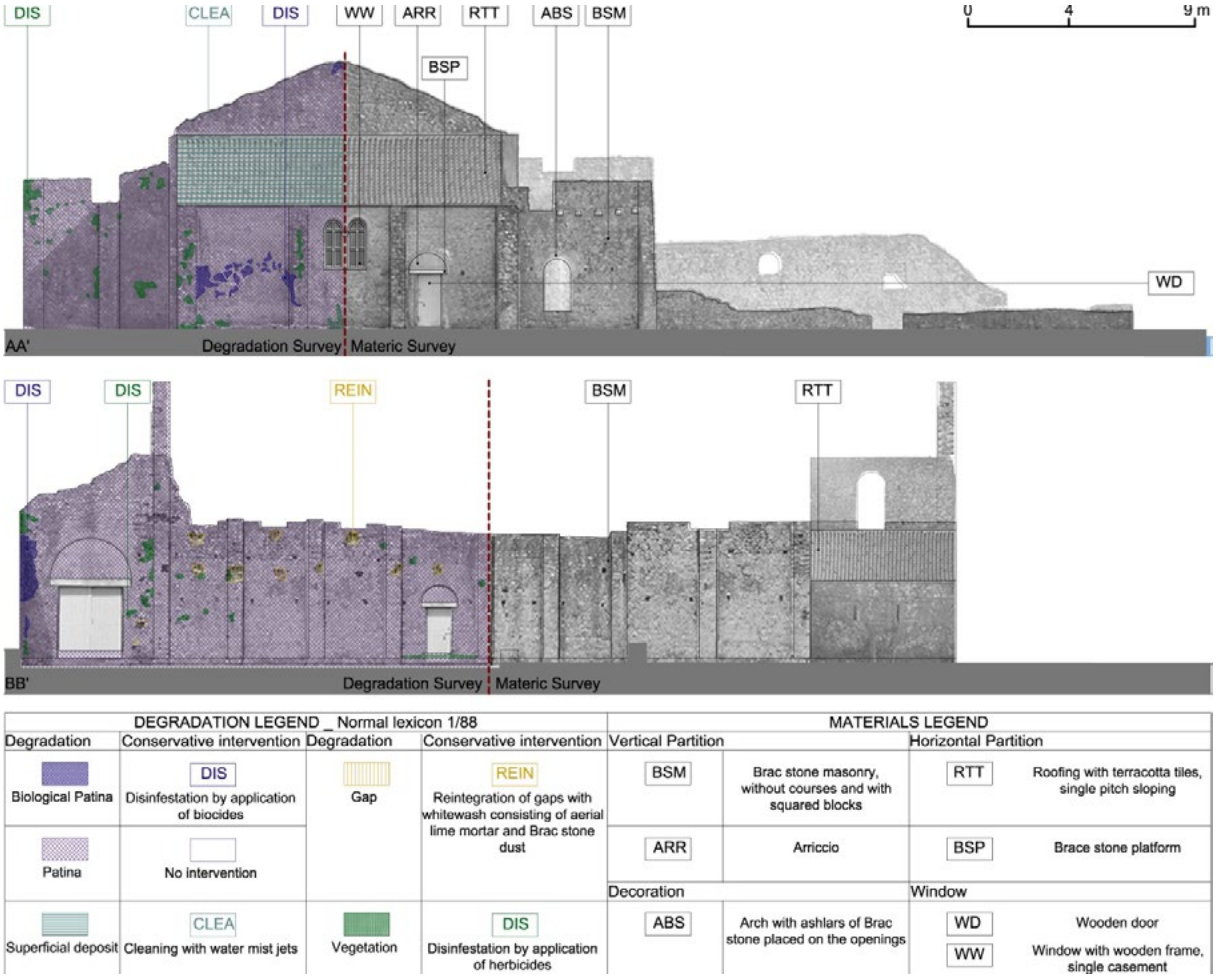

Fig 3. The Mirine Early Christian Basilica: degradation and materic survey. North Elevation [above] and West elevations [bottom] (Adriana Trematerra, 2022)

3. Cognitive and diagnostic analyses for restoration and valorisation of abandoned religious complexes

Following the analysis of the historical context of the area of the study, the research envisaged a number of survey campaigns carried out in August 2021. The aim of this phase was to document the current state of conservation of the Early Christian Basilica of Mirine, in order to identify critical points and potentialities capable of constructively directing the restoration and reuse interventions to be pursued. At this stage, the survey was considered as a tool for critical observation and investigation which, combined with the graphic processing of the acquired data, allowed the interpretation of reality, acting as a fundamental cognitive basis (Carocci, Circo, 2015) for any subsequent operation.
In this context, the image-based survey procedure [Fig. 1], carried out by means of digital cameras and drones, proved to be the most suitable both for the need of a quick and economical measurement and for the possibility offered by the latter to obtain detailed digital models of the tangible aspect of the analysed artefact (D'Aprile, Piscitelli, 2020). The data obtained from the survey campaigns were processed using software for three-dimensional modelling in order to represent reality by means of a detailed digital model of the analysed artefact, consisting of the point cloud (Manfredini, Remondino, 2010) and a series of orthomosaics. The first result obtained from this cognitive method is the graphic elaboration of the plans, elevations and sections of the early Christian basilica of Mirine [fig. 2].

Subsequently, a material survey and degradation diagnostics were carried out in order to identify the current state of conservation and the tangible consistency of the artefact analysed. In particular, the results of this cognitive and diagnostic process applied to the Northern and Western elevations are shown [fig. 3]. In order to understand the current state of conservation, this methodology represented a peculiar phase of the research, as it allowed the identification of the surfaces affected by manifestations of degradation and the general state of conservation (Picone, 2004). From a conservation point of view, only a few walls of the basilica remain, while the roof has been almost completely destroyed. The most common pathologies found in the survey of degradation are patina, encrustation and the presence of vegetation. The investigations and surveys carried out made it possible to draw up some guidelines for future intervention strategy aimed at the restoration and reuse of the architectural artefact analysed. As part of the preservation of the ancient material, the intervention could include the elimination of weeds by means of herbicides. In addition, the existing structure could be preserved from atmospheric agents through the addition of a new iron and glass roof, placed on a cavity filling consisting of a mixture of lime mortar and local stone powder. As a result of the lack of socially attractive spaces in the vicinity of the religious complex, the spaces of the nave and cloister could be reused as a restaurant, while the outdoor spaces could be used as gardens for the cultivation of local, zero-km products. Inside, the presbytery area could be used as a stage for live music performances.

3. Conclusions

The research conducted can be considered as a possible methodological approach of knowledge aimed at the valorisation and conservation of abandoned heritage. The practice of restoration and reuse of abandoned religious complexes represented an important path to follow for this purpose. Moreover, the aim of the survey was to promote the knowledge and enhancement of forgotten architectural artefacts and their environmental context. In this perspective, on the one hand the preservation of ancient material that has survived to the present day has been pursued, on the other hand the attribution of a new function through the addition of cultural attractions. The latter may be able not only to recover the abandoned heritage but also to regenerate the highly degraded landscape and environmental context. The enhancement of the analysed heritage through the reuse of common spaces as places of social aggregation becomes a concrete possibility of reintegrating abandoned architectural complexes, to be recovered and reused as a social and cultural added value of the contemporary city.

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04 Urban transformations: projects, strategies, actions

Learning from Covid 19. Sustainable strategies for the regeneration of peripheral areas

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Abstract

What does the pandemic teach us about the future of cities? The violence with which the pandemic crisis has brought to the collective attention the fragility of urban models (designed according to established planning criteria) imposes the need for a radical change in the conception of the spaces where human life takes place, which is based on a transdisciplinary and long-term approach. In this context, through the illustration of a specific case study developed within the PINQuA Program (National Innovative Program for the Quality of Living), the contribution proposes a system of experimental regeneration strategies based on unusual techniques such as demolition, superfetation and forestation, imagining a model of sustainable city capable of responding and evolving in a flexible manner to the emergence of new and unforeseen conditions.

Keywords

Urban regeneration, Social inclusion, Quality of living, Functional mixité, Sustainable reuse

1. Introduction

The COVID-19 pandemic has brought to the collective attention the widespread condition of inadequacy that characterises consolidated housing practices, revealing their fragility and imposing a strategic reflection on settlement systems and on the very idea of the contemporary city. Thus, as has already happened several times in the course of history, architecture and design have been called upon to rethink men's habitat in the light of the changes imposed. Picking up the threads of the multi-scalar approach *from the spoon to the city* with the intention of reconfiguring the relationships between the living dimension and the urban dimension, it is evident the necessity of regeneration practices implemented through new inspiring principles aimed at pursuing sustainability in both environmental and social terms, favouring the use of adaptable and innovative systems. In particular, in the case of peripheral areas, where there is a tendency for changes and adaptation to new needs (Bentivogli, 2020), regeneration strategies must favour the reinterpretation of the roles of spaces and places where daily life takes place, encouraging a radical change in programmatic policies for managing housing needs. Synthesized in the slogan «*doing more with less*», Stefano Boeri claims the importance of a continuous creative redesign that, in the Italian context, has always made a virtue out of necessity, enhancing the relationship between resources, constraints and opportunities (Berni & Boeri, 2012). In detail, the recovery to life of buildings and rooms that require a new use (functional reorganization theme), the requalification and adaptation of plant systems (energy efficiency theme), the replacement of degraded and compromised buildings (widespread demolition theme) and the election of urban greenery as a strategic resource aimed at contrasting the negative effects produced by pollution and climate change (urban forestation theme) outline a possible and concrete strategy for the regeneration of suburban areas. If combined with the ability to stimulate a transdisciplinary and long-term approach, it leads back to the concept of the malleable city pioneered by Bernardo Secchi (1984) and updated by the most recent studies of Luc Gwiazdzinski (2014).

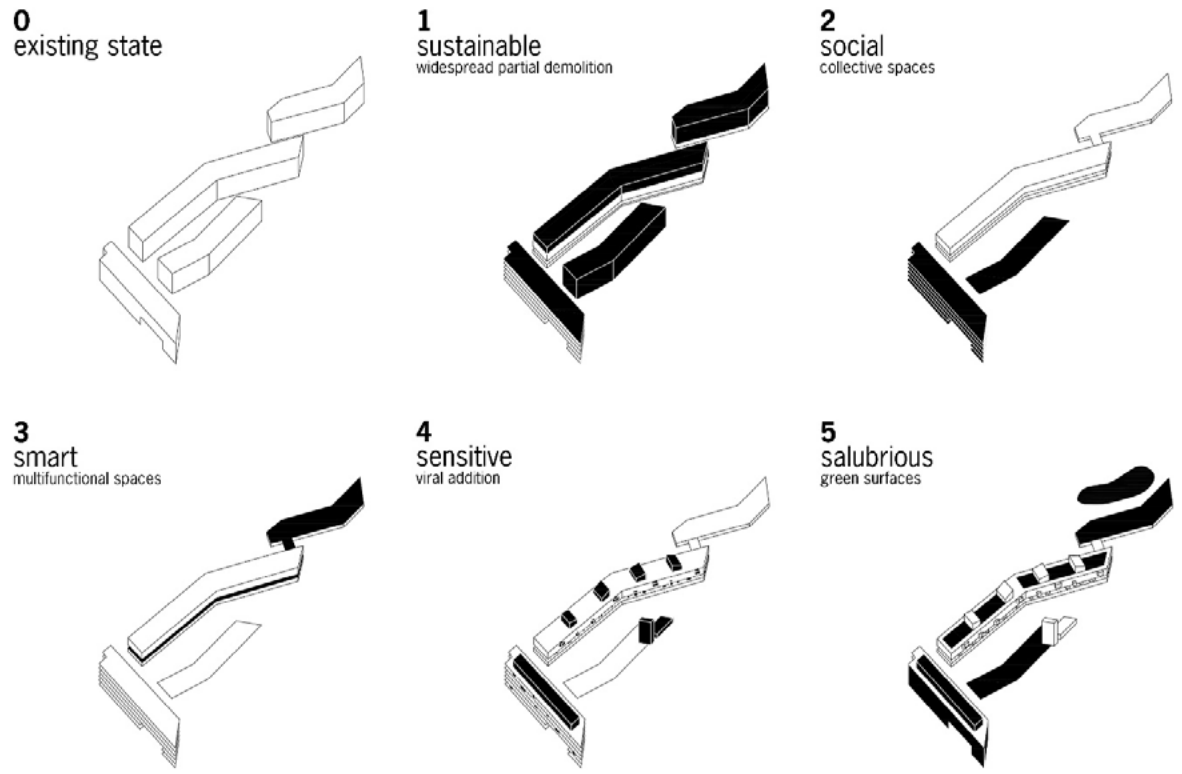

Fig 1. *PS[5]G*, Concept (authors' elaboration, 2022)

2. PS[5]G: the case study of Ponte San Giovanni in Perugia

Within the theoretical-methodological framework mentioned above, an experimental project is being conducted which, starting from a condition of widespread and diversified fragility and poor housing quality, a radical transformation of the originally planned housing model is proposed. The project is located in the congested suburb of Ponte San Giovanni in Perugia (with a population of about 20,000 inhabitants and a population density over three times the average of the municipal area). More precisely, the area is located on the western side of the suburb's historical core in a strategic position, both because it is lapped by the railway station and the viaduct of the Perugia-Bettolle motorway junction, and because it is closed to the Etruscan archaeological area of the Hypogeum of Volumni, identified by the nineteenth-century building (*Palazzone* Funeral Museum), first work by Guglielmo Calderini. Such presences, while providing evident opportunities for the enrichment of the place, in the most recent development of the city still lack a real connection, remaining a set of fragmented singularities, which also reflects on the social sphere, with the consequent worsening of the quality of living. It is no coincidence that the project was developed and presented in the framework of the *PINQuA Program* (*National Innovative Program for the Quality of Living*), aimed at reducing housing and settlement discomfort, with particular reference to peripheral contexts (Ministry of Infrastructure and Transport, 2021) and financed within the PNRR (National Recovery and Resilience Plan) resources. The programme promotes an approach oriented to the actual quality of housing, as the result of a system of interventions and synergistic factors capable of defining an evolved model of regeneration from an environmental, social and transgenerational perspective. Specifically, the design area consists of a block marked by four buildings originally intended for residential use, with a high population density, which have never been completed and have therefore never become an integrated part of the urban fabric. Starting from the results of the analysis phase, the urban regeneration proposal aims at responding to five types of vulnerability by proposing as many design strategies represented by five key adjectives: sustainable, social, smart, sensitive and salubrious. Five "s" able to strengthen the Ponte San Giovanni suburb, hence the acronym PS[5]G [fig.1]. In particular, the project meets vulnerability in sustainable terms by means of widespread partial demolition, intended as architectural and urban

Fig 2. *PS[5]G*, Infographic simulation before (up) and after (below) the intervention (authors' elaboration, 2022)

thinning to counteract high building density and increased energy consumption. The project meets vulnerability in social terms by providing a multiplicity of neighbourhood and collective spaces, but above all by giving an entire building the role of a social condenser capable of hosting a mix of cultural and recreational activities to encourage social and generational integration. The project meets vulnerability in functional terms by providing multifunctional spaces, conceived within modular structures to increase temporary and adaptable solutions to host constantly changing activities. The project meets vulnerability in typological terms through the viral addition of light wooden carpentry superfetations and the use of recovered modular elements, favouring typological enrichment as well as a multiform and variable image. The project meets vulnerability in healthy terms by disseminating green surfaces, electing the vegetation component as a building material and declining it both horizontally (to ensure a widespread system of small gardens, both at ground level and at roof level) and vertically (to give a communicative role to the condenser building while improving the environmental conditions of planned social activities) [fig. 2].

3. Conclusions

Conceived according to the innovative model of the *15-Minute City* (15minutecity.com) in which the basic needs of citizens (work, leisure, education, health, culture) are satisfied in about 15 minutes from their homes, the PS[5]G project interprets the concept of life quality on a neighbourhood scale, proposing synergetic interventions addressed to the entire neighbourhood system. To summarise, while on the one hand the project aims to promote sustainability and energy efficiency through innovative and experimental superfetations and intelligent technological systems, on the other hand it aims to increase community participation in the active life of the neighbourhood by repopulating an abandoned place and giving it a renovated social value [fig. 3]. These strategies, reinterpreted in the light of the pandemic and post-pandemic scenario according to a model of "integrated policy [...] of the so-called 'material welfare' [...] as a tool for social integration and environmental and ecological requalification" (Pasqui, 2020), show their effectiveness in accompanying the transition of mediation between the urban scale and the

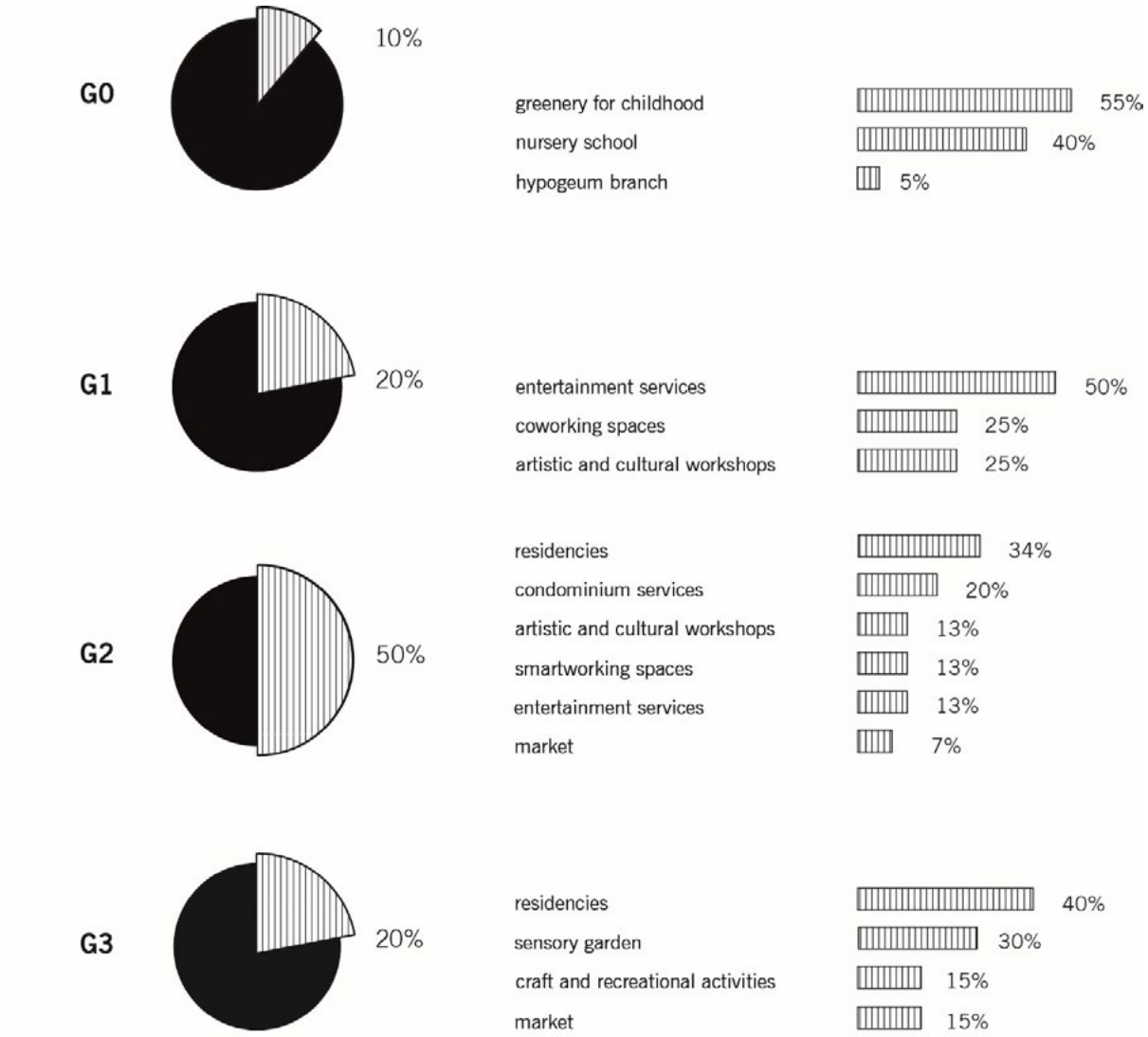

Fig 3. *PS[5]G,* Social mix, infographic (authors' elaboration, 2022)

domestic dimension and in allowing the overall adaptability of settlement systems, under the banner of functional and typological innovation. In addition to meeting a specific epidemic situation, the prefigured design strategies pursue the general objective of preparing cities for change, building men's habitat capable of absorbing not only the needs of the present but also the evolutions of the future. In fact, with specific reference to the architectural and urban scale, it is now evident that the redesign criteria for both buildings and cities cannot be linked exclusively to human needs. As demonstrated by the COVID-19 pandemic, human life on Earth is part of a comprehensive system, which includes a variety of processes and components (from environmental to technological) that can no longer be neglected or excluded from the design vision. In order to cope with the occurrence of changes is thus necessary a model of city adaptable and capable of responding to unforeseen needs: a model in which the interaction between multiple factors is taken into account and that therefore makes necessary the transdisciplinary comparison.

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Historical city and urban voids as elements of cultural heritage: theory and projects for Aversa discontinuous city

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Abstract

Recognizing the value of historical urban cores and open space in contemporary urbanized territories, this contribution proposes a regeneration strategy for rarefied and hypodense urban areas. It is based on the re-signification of voids preserved from urban growth's aggression. These places can become benchmarks-monuments of the new urban-territorial dimension of the city (Costanzo, 2008).
To verify this theory, an application case is shown: it is about the medium city of Aversa and its north-western conurbation, which stands as an urbanized ring around a system of central voids. Considered as architectural fields, they can accommodate complex architectural units hosting public-collective uses. They are conformed according to collocative settlement logic exalting the qualities of the void. They also define links with historical cores, re-proposing, in new forms, the original relationship existing between the cores themselves and the countryside (open space) that is now lost.

Keywords

Urban discontinuity, open city, supra-municipal entity, void, architectural field.

1. Introduction

Responding to the NEB's *rappel à l'ordre* means, for architects, going back to general premises we can share with the Bauhaus experience, that is, the idea of tracing back every phenomena of life to a cultural factor. This issue no longer means seeking a unitary formal expression, a *style*, as Behrens said, but seeking the *result of all the spiritual manifestations of an era*, as happened in the *Werkbund* led by the German master himself, that was the model for the Bauhaus conducted by his students Gropius and Mies. The theme is therefore the construction of our modernity starting from creation of connections between knowledges, overcoming the impasse phase deriving from the hyper-specialized knowledge incrementation. More specifically, technique (and economy) and art, while responding to their own laws, must find a convergence and must seek appropriate shared forms, to achieve a more general awareness of the effects affecting our existence.
Beautiful, sustainable, together are therefore the chosen words and with them we today must identify - as Hillmann suggests - a *politics of beauty* (Hillmann, 1999), so necessary for public life, community and city.
The city and its theory, as general knowledge to be declined in technique and art, stand at the centre of the question.

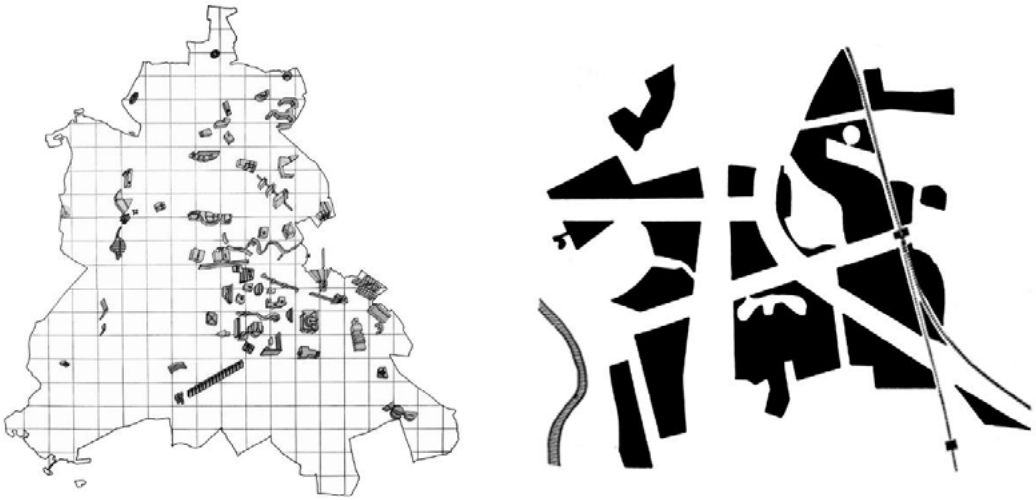

Fig 1. Left: Ungers, O. M., Koolhaas, R., Riemann, P., Kollhoff, H. & Ovaska, O. (1977). Berlin: a green archipelago; Axonometric diagram. Right: Koolhaas, R., Brunier, Y., de Geyter, X., Guyer, M. & Reuse, L. (1987). Ville Nouvelle Melun Senart; the Islands.

2. Cultural heritage and theory of urban discontinuity: the value of historical city and open space

Through this *intersection of knowledge*s (Capozzi, Costanzo, Defilippis, Visconti, 2021), we refer to a general idea of *cultural heritage*, according to a broader notion of heritage in which the value of all its elements is recognized: the historical city assumed above all as a *form*; the isolated artefacts – relevant from an historical and architectural point of view – that can be considered exemplary in defining the *type* and in its alteration/transformation; the signs of the land for their productive and documentary value (as traces); the Twentieth Century planned city as result of public intervention aimed at producing architectural-urban models; the old and new infrastructures considered as the synthetic lines of use and perception of urban and territorial entities; but also the more recent ones, that are the outcomes of the correct and adequate *interrelation between natural and anthropogenic factors* (European Landscape Convention, 2000).
It appears necessary to redefine and update the value and meaning of these elements belonging to cultural heritage, that constitute a variegated and often stratified system, difficult to be read and to be understood (Capozzi, Costanzo, Defilippis, Visconti, 2021).
With a strong radicalization, historical city and open space undoubtedly represent important terms within urban and territorial realities.
Yesterday as today, within a modernization project and despite urban incongruities, we refer to them to define the idea of a measurable city *standing in nature* as a starting condition for establishing future ways of life. In this sense, our theoretical framework consists of the urban discontinuity, a condition in which we must re-establish the relationship between city and historical traces.
This framework is based on the Enlightenment premises - Ledoux stated "*revenons à la nature: partout l'homme est isolé*" – and it places the urban context within a predominantly natural horizon in which the architectures - initially free from historical forms' conditioning - reach their own *autonomy* according to the *pavilion system* principle (Kaufmann, 1973). It then goes on with *open city* rational models by Ludwig Hilberseimer (Hilberseimer, 1927), Ernst May, Hans Schmidt (Schmidt, 1974), in which independent units, with clear formal identities, are part of a system guided by infrastructures and conformed on geography (which Braudel identifies as the first forms of history) and, recently, with models based on the metaphor of the *city as archipelago* (Ungers, 1977), a set of isolated pieces (loaded with memory) representing a plural entity and evocating the different times in the evolution of the city (Fig. 1).
In these researches that propose an urban idea based on the separation of the elements, we recognize a further development, deriving from the acknowledgment of the profound weakening of historical city's generating role in urban formation dynamics.

These developments are based on the idea that the resistant urban voids in rarefied cities - emblem of the modern formative processes' discrepancies - can play the role of public-collective benchmarks: voids are considered as new monuments representing new urban-territorial dimension of the city and they are designed to reveal new relational and selective forms for urban fabrics and big historical artefacts.
In these ways, the historical city come back to participate in new dynamics, as part of a more complex urban entity.
In the Italian context we find the elaborations about *urban islands* by Antonio Monestiroli (Monestiroli, 1997); the complex units as result of *critical montage* procedure by Gianugo Polesello (Polesello, 1991); or the *zolla* by Bisogni (Bisogni, 2011). Recent theoretical elaborations by Francesco Costanzo (Costanzo, 2008) are referred to these works. He proposes the concept of *collocative fields* as heteronomous and polysemic entities. They find in *dispositio,* considered as discontinuity's compositive criterion, the most appropriate device for exalting the separation, read as fundamental condition of contemporary urbanized territories. Here, the original *autonomous principle* is overcome in favour of heteronomy, that selectively summons the existing city as a reference system of formal and cultural values.
This theoretical framework is assumed for some works conducted in Department of Architecture and Industrial Design. It stands as the convergence moment between activities by Research Group, working on applications *converting abstract knowledge into multifaceted usefulness,* and projects led in the Architectural Design Atelier, in which the didactic subject is faced as a complex unity (the contemporary city as need of time and physical reality).

3. The North-West Aversa Field as an application case

To verify this theory, here we show an application case regarding Aversa, a medium city standing in the centre of fertile plain once known as *Campania Felix* and established by Normans in Middle Age, that now is a medium city hosting the two polytechnic departments of the *Università della Campania*.
Although this is a specific case, the phenomena of urban growth and transformation interesting this city regard a recurring trend in the development of the European medium city, over the last thirty-five years. We refer to the welding of distinct urban entities generating conurbations and drastically reducing the extension of open spaces, these latter once formed the background of a point-like urban system and now tend to become figures surrounded by urbanization.
In light of that, the project here proposed, while working on the critical re-consideration of specific conditions of this city, has the ambition to experiment a general strategy, applicable to a wider range of cases.
Aversa is here considered an urban entity overcoming its own administrative limits and standing as a system formed by several urban polarities, that were once rural aggregates standing as devices for controlling and exploiting the countryside. The fast and deregulated growth processes affected these poles, mainly between 1970 and 1990, put their formal recognisability in crisis. This way Aversa and the other urban polarities become a single supra-municipal entity with a latent multipolar quality.
Alongside this condition, something common to the evolution of this area and to what is happening in other European urban contexts, we can recognize some specificities deriving from the Norman city's historical evolution, which become relevant within a design framework aimed at redefining its formal structure in the light of changed conditions.
We refer to significant elements in its urban structure, such as the original core with its concentric rings and the modern grid-like expansion known as *Lemitone*, which are still clearly legible despite the aforementioned growth, but also to the persistence of some monumental cornerstones, such as the large monastic complexes (including the San Lorenzo Abbey), the Aragonese castle and the big Norman cathedral.
The morphological analysis highlights therefore the resistant formal value of the historical cores (in particular the Aversa's one with its monuments) and of the ancient urban and territorial layouts presiding their foundation, such as the Roman *centuriae*, but it also underlines the strong presence of high quality planned urban parts, expressing the public intervention for mass housing in Twentieth Century. The same analysis also highlights pathological effects: among these and first of all, we can recognize a lot of deregulated and occasional residential agglomerations, based on typological choices (the isolated building as a *monad* in the lotting mechanism) denying any settlement logic expressing urban value.

Fig 2. North-West Aversa Field, analysis. Scale 1:67000.
Left: Infrastructural system analysis. Center: Building heights analysis. From light grey to black: from one-story to four or more storey buildings. Right: Spatial analysis. Natural open spaces as black areas; public open spaces in dark grey; appurtenant open spaces in light grey; buildings in white. (Costanzo, Oliva, Pellino, 2022)

The inability of controlling these growths produced the extensive erosion of open space and the consequent loss of a recognizable *Forma Urbis. On the basis of the morphological analysis,* we can state that a relationship between the individual urban polarities, welded with a characteristic annular shape, is possible thanks to the presence of large urban voids, whose interpretation is therefore decisive for the fate of these cities (Fig. 2).

4. The *complex architectural units* for the *North-West Aversa Field*: the University, the Sports Centre, the Civic Centre

In the project hypothesis (Fig. 3) these urban voids are therefore rethought as *urban fields*, where *complex architectural units* for public-collective use can be settled. These units preside over the *field* – and its rural nature – and exalt its collective and urban vocation, as monument-benchmark with a compliant size respect to the new dimension of the city.
In particular, for the *North-West Aversa Field* - deriving from the annular entity formed by Aversa, Trentola-Ducenta, San Marcellino, Frignano, Casaluce and Teverola - some *complex architectural units* are identified. They take on a territorial role and they are linked to the theme of sport, the civic centre and polytechnic education.
Each of them has a relationship with a historical core or with important historical monuments. In the link between *complex architectural unit* and its reference core, the project wants to solve the loss of the original relationship existing between consolidated centres and countryside, as the units give to the cores the open space's features.
The *complex architectural units* have collocative settlement logics, in fact they are constituted through a calibrated separation/tension between isolated artefacts with evident formal identity. This way they try to represent the void's qualities, the void itself becomes the necessary space for buildings, space *between* architectures.
Other interventions are:

- Urban consolidation of the E/W transversal connection line (axis) crossing the *field* through a tight repetition of high buildings (blades), distant elements representing the linear condition in a discontinuous form. Their height makes the axis' peremptory nature visible at distance. These architectures, hosting houses and small work spaces, replace the existing buildings or define an infrastructure for connecting them, modifying their internal distribution logic;
- Localized recovery and regeneration interventions on recent non-homogeneous urban fabrics, aimed at contrasting the lotting principle and consistent in two kinds of operations:
    - Plots saturation through the creation of *bases* (like Burri's *cretto)* for commercial and tertiary uses, constituting the ramparts of the buildings;
    - Replacement of existing buildings with patio houses blocks determining intermediate spaces for social aggregation;

- Reduction of emerging architectures to the constructive frames bringing back these artefacts to a tectonic nature, available for process of new formalization and functionalization.

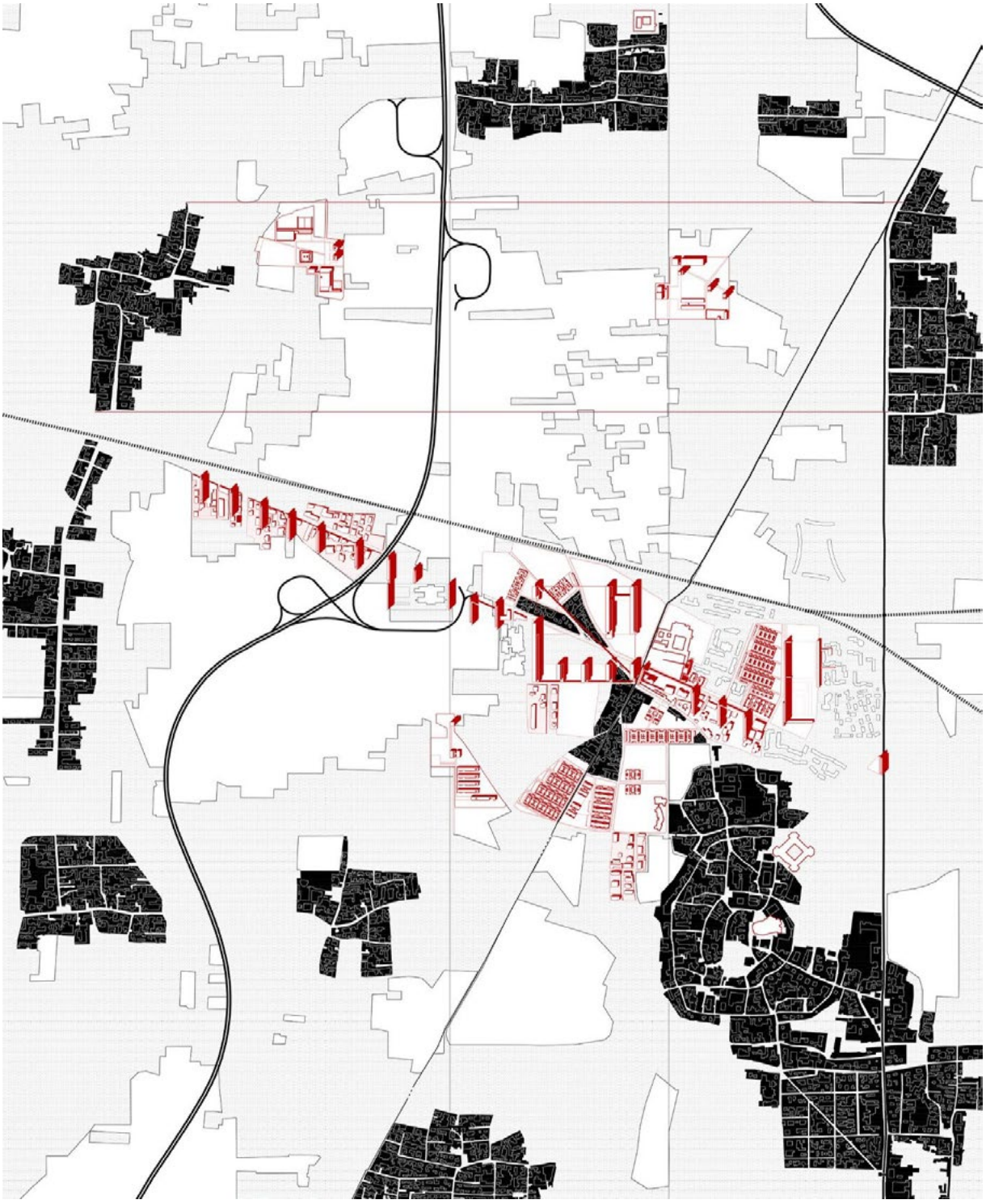

Fig 3. North-West Aversa Field, project. Scale 1:20000. Project interventions in red; historical cores as black areas; planned modern settlement as black empty figures; main infrastructures as thick black lines; selected centuriae as thin black lines; urbanized areas as black dotted figures. (Costanzo, Oliva, Pellino, 2022)

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Architecture from rubble. To "rebuild the imaginary"

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Abstract

The contemporary imagination seems to be separating from the physical world; it stops producing concrete forms and symbols as its direct secretions. Architects are already designing "buildings" for the metaverse, architectures that do not have physicality as their final goal. On the other hand, this moment in time is characterized by a sense of estrangement in urban and landscape scenarios produced by building remains, fragments of a recent past. The cities, the landscapes, are increasingly densely dotted with unfinished or abandoned artifacts, buildings, warehouses, huge infrastructures, destined or to be destined for destruction. Rubble, present now or in the near future, can become material to be molded. Signs of decay can reveal potential for a new, as of yet unexpressed meaning. However, using rubble as a building material is not just a technical matter, as it regenerates the act of building, while "rebuilding the imaginary".

Keywords

Architecture, Contemporaneity, Imaginary, Ruins, Rubble

1. “White noise” as a code: is the contemporary imagination "broken"?

The first 5000 Days is an NFT (not fungible token), which is a non-duplicable digital work by the artist Beeple, made up of a collection of 5000 different images. It is an artwork devoid of a sense of depth and obviously of materiality, with the shapes of the individual images merging into a single infinite swarm of colors.

The work is a kind of paradigm of contemporaneity, a mirror of the imagination of our time. In this age of the endless proliferation of images, put together they can give rise to a "white noise" effect. Something that refers to the novel *White Noise* (DeLillo, 1985) [fig. 1].

The imagination seems to separate from the physical world, it stops producing concrete forms and symbols, as its direct secretions. It happens under the immeasurable pressure of the forced injection of signs, imposed by pervasive communication systems. Those signs are no longer developed by natural spontaneous growth, the natural evolution of human interiority.

Architects are already designing "buildings" for the metaverse, designing architectures that do not have physicality as their final goal ("Archdaily", 2022).

The so-called “visionary architecture” never had the purpose of being constructed. Architecture of the metaverse seems to have the characteristics of a professional performance,

required by a new sector of the "real estate" market (financial, actually that operates in the absence of physical space), rather than the search for new visions about living space (later maybe it will generate new visions).

In the contemporary world, the relationship with nature is mediated, happening through a series of infinitely manipulable tools. In the metaverse, the reduction of corporeality to sensory stimuli of machinic

Fig 1. White Noise (Raffaele Marone, from *Lisola* series) 2008

origin determines a solution of continuity in the perception of things in the physical world. Human feeling depends exclusively on inanimate devices.
"Augmented reality" is something added to the physical reality. The architecture of the metaverse can be a research field, if it will be visionary, certainly not a substitute for the experience of the physical world, in which case it would result in a "diminished reality".
“Why is the broken brother broken? One wonders if the landscape is also broken... The landscape reflects something that happened in the mind / heart of humans and it is also in ruins ... "(Gualtieri, 2021, p. V). Is contemporary imagination "broken"?

2. World disease. Images and words crossing through the ruins of a civilization

"London Bridge is falling is falling is falling... These fragments I have shored against my ruins" (Eliot, 1998, p.42). The manifestation of discomfort with the world is a form of modern expression, through the twentieth century, until today. The forms are many. Within the book-form, they absorb different linguistic materials; as photography, in the Brechtian *Kriegsfibel* (Brecht, 1955), where words do not comment on the war pictures presented. In *War Primer 2* (Broomberg, Chanarin, 2011) words and images come together to create a powerful linguistic mixture. The photographs of the originary work by Brecht are mutilated, and the cut parts are replaced with war images from 2001, with an even more crude result, if possible.
A diorama, by definition, is a representation of a panorama that is as faithful as possible to the real one. A recent photo book tries to describe the present by extracting images exclusively from the internet. The texts are not didactic, but serve to activate continuous disturbing short circuits of sense (Magurno, 2016). Almost half a century ago, in the context of a literary analysis Gianni Celati, with impressive intuition, identified a fundamental character of the mental, but also physical, space of our time: the sense of estrangement produced by urban and landscape scenarios, made of building remains, fragments of buildings from a past, too recent to be enveloped in an aura (Celati, 1975).

Fig 2. Rubble (Raffaele Marone) 2022

3. Rubble as living matter. To "rebuild the imaginary"

> The spectacularization of the world is, in itself, its own end; in this sense, it wants to express the end of history, its death. The ruins, on the other hand, still show signs of life. The rubble accumulated from recent history and the ruins born of the past are not alike. There is a great gap between the historical time of destruction, which reveals the madness of history (the streets of Kabul or Beirut), and pure time, 'time in ruins'... 'Pure time' is this time without history, of which only the individual can become aware and of which the spectacle of the ruins can offer him a fleeting intuition. (Augé, 2003, p. 135).

If, on the one hand, Augé distinguishes in an admirable way the meaning that "ruins" and "rubble" have assumed so far [fig. 2], on the other he allows fruitful openings to architectural thought, stimulating the definition of new strategies of expressive action in the inhabited space.

Cities and landscapes are increasingly densely dotted with unfinished or abandoned artifacts, buildings, warehouses, huge infrastructures, destined already or to be destined for destruction. That rubble, in the near future, can become material to be molded. Today, signs of decay, becoming quarries for building materials, can generate still unexpressed meaning and, moreover, after their removal, return freed soil. In the last decades of the Twentieth century, some architecture projects, such as James Stirling's *Derby Civic Center*, or the *Museum* and the *Secret Gardens* in Gibellina, by Francesco Venezia, reinterpret the ancient practice of spoliation, incorporating ruins into new buildings. This practice has spread over time even if, at times, devoid of meaning. Authenticity in architecture, as in human action in general, is always a question that thought must address in depth (Jaspers, 1950, p. 49).

A new compositional concept can push the current limits of the practices of reuse even further. Those landscapes of abandonment, usually cataloged as territories of urban and building decay, can take on forms and meanings appropriate to our time. Parts of old manufacts, seen through the conceptual lens of contemporary *Kintsugi* practice (Yeesookyung, 2014) of repairing broken objects with gold (derived from a technique conceived in 15th century Japan), can be re-composed in new buildings, as a sort of intentionally “wrong” anastylosis, showing the seams as elements of value.

“We compact the rubble that is so much a problem for everyone, we reinforce it well, and with the concrete we make an immense white crack, so that it remains a perennial memory of this event” (Zorzi,

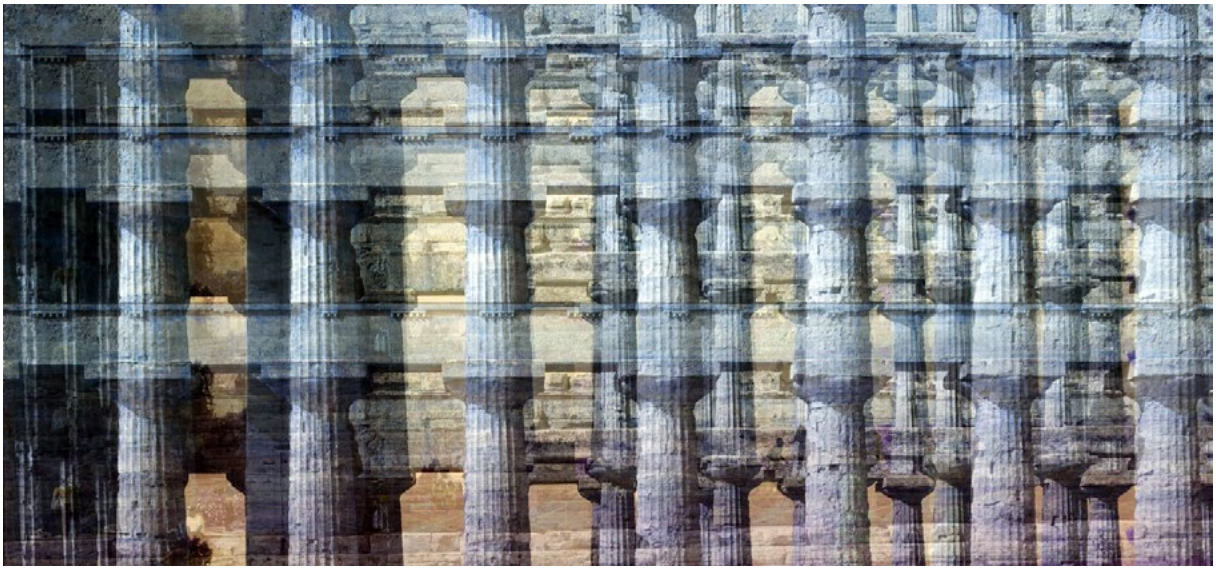

Fig 3. Ruins (Raffaele Marone, from *Eternal Present* series) 2020

1995, p. 27). This is how Alberto Burri recalled the intuition that would lead to the creation of the *Great Cretto* in Gibellina (1984-1989).
An expressive tool: the installation is a conceptual territory on the border between architecture, visual arts and, more generally, a field of possible significant interactions among any forms of expression. Furthermore, understood as a modification of the emotional and perceptive qualities of an existing space, it is present in the history of human cultures from the *Chauvet Cave*, to date the first space modified by human beings with symbolic intent, up to us (Herzog, 2010).
The installation involves immersion in space, not producing works to contemplate. Contact by immersion involves the centrality of the body in the experience, and favors a broader understanding of a massive audience, albeit in the singularity of individuals. For all these reasons it can be considered a privileged form of experimental exploration of future inhabited spaces (Rosenthal, 2003).
In the Alpine landscapes of the Canton of Ticino, collective installations take shape from the rubble of vernacular artefacts, created with the coordination of the architect Martino Pedrozzi.
The *Seven Heavenly Palaces* (2004-2015) by Anselm Kiefer at *Hangar Bicocca* in Milan is a construction of rubble (Amadasi, 2018). Here the oxymoron, going far beyond metaphor, becomes real space. The work indicates, within an enormous dark space, a road to contemporary living, to build meaning from and with the rubble of a civilization.
An architecture made of rubble is a seminal work by Snozzi. “For the redevelopment / reconstruction of the historic center of Braunschweig (1979) … a project that envisaged completely freeing the center from rubble, placed where the baroque walls were built to form an enclosure as in medieval cities” (Gambaro, Snozzi, 2015, p. 310).
Using rubble as a building material is not just a technical question, linked to the necessary technological and regulatory innovations of the building waste cycle. By applying “the principle of metamorphosis” to rubble (Focillon, 1936), the sense of the act of building is regenerated, while "the imaginary is rebuilt” [fig. 3]. However, it is essential that, in reuse, the imperfection of the surfaces, the roughness of the grain, those visual and tactile traits that will remove abstraction from the light always remain visible, giving it the warmth of sensuality, in a thousand unpredictable shades.
“What matters, on the other hand, is language not bound to absolute values, but in movement, according to its own reproductive system that is neither flat nor superficial. The problem therefore brings us back to the project and the intent to free the text, visual and architectural, to make it circulate in the world and

give it back a power of surprise, so as to relocate it in the paths of movement and change, where the imaginary is rebuilt " (Celant, 2007, p. 11).
Architecture, engaged by nature in the perennial struggle with the force of gravity, arrives with the weight of its stones, after other human actions to transform the world, but it changes the concrete and symbolic scene of life, its emotional and perceptive states. In order to go beyond the flattening of the spectacularity that characterizes much of the production of these years, architecture can, as it has always been, draw on other expressions of thought: acquiring ever greater awareness of reality as a continuous transformation in the *logos* / *chaos* interaction, moving forward towards new forms of beauty (Mancuso, 2020); observing time and things in every South of the world (Cassano, 1996); forgetting as much as possible, to bring the gaze back to the practice of wonder (Candiani, 2021). Even so, architecture can still arouse the "secret faith of the time. 'Substance of things hoped for'" (Persico, 1945, p.42).
"If humanity will be lucky / the archaeologists of the rubble of history will bring to light / still something of the nostalgia for a universal culture / If humanity will be still lucky they will be men / the archaeologists on the rubble of history" (Fried, 1994, p. 57).

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Sustainable Recovery and Urban Public Transformation of a Former Military Park

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Abstract

As a result of the pandemic, public places may undergo significant changes, including new spatial planning and major behavioral shifts. Although public space can still be a place for social interaction, it may be more difficult for the unplanned and spontaneous one.
Applied research is described through the project of requalification of an area related to the former military park in Lentate sul Seveso (MB), in Italy. The project proposes the realization of student residences integrated with multifunctional spaces for local communities, emphasizing the importance of structure recovery and sustainable urban transformation. The project's final result is the creation of a space for aggregation as an extension of urban public space, which can enhance the productive resources of the area and its history, looking beyond the local dimension.

Keywords

Participatory actions, disused spaces, regenerative design, sustainable design, public policy.

1. Introduction

Currently, cities are littered with abandoned buildings and disused spaces. This heritage has a lot of potential for sustainable development and it is a viable response to the waste of resources. Understanding cities as a source of sustainability possibilities, promoting active collaboration among diverse stakeholders, integrating different perspectives of knowledge and expertise, and encouraging experimentation with different solutions and approaches are all part of sustainable urban transformation (McCormick et. al. 2013).
"The groundwork for macro-transformations and for great systemic changes is laid by micro-transformations and by local systemic discontinuities" (Manzini, 2006). Design can play a key role in identifying, processing, and applying these micro-transformations. The project of requalification of the area related to the former military park in Lentate sul Seveso (MB) has a significant territorial value both locally and supra-municipally, owing to the strategic location of the structures, which are close to public amenities and connections, such as the Lentate/Camnago railway station and the *Polo Formativo Legno Arredo* school.
The applied research project was conceived by a team of researchers of the Design Department of Politecnico di Milano, in collaboration with the municipality of Lentate sul Seveso, owner of the properties subjected to requalification. The intervention area consists of three parts: Lot A, Lot B, and a complementary area to Lot B [fig. 1].
The project's goal is to allocate Lot B to residential services (for students of the nearby school, teachers, and visiting) using the complementary area for parking, and to address to Lot A the local community-related functions, including a playroom for children, the *house of associations* and a cafe/social club.
The main result of the research was the elaboration of the project proposal at the level of a feasibility study, according to the *National Recovery and Resilience Plan* principles. Building a community is one of the primary outcomes, a challenging goal because of the Covid-19 pandemic, which affected relational behaviour, resulting in significant changes in public space use and design.

Fig 1. Planimetry of the Lots' state of facts in the former military park in Lentate sul Seveso. Lot A includes a building and an outdoor area of 1.258 sqm; Lot B has two buildings and a green area of 3.607 sqm; Complementary area to Lot B measures 4.052 sqm in size with no built structures (Authors' Credits)

2. Participatory actions applied to post-pandemic crisis policy principles

The former military park project takes place in real-world environments, engaging the participation of local administration, the major stakeholder, namely Polo formativo Legno Arredo school, and actors from the corporate sector. These participatory actions matches two primary characteristics of a new methodological approach known as the real-world laboratory (RWL) consisting in a "close relation to the concept of transformation" (commonly connected with sustainability) and the "co-creation of knowledge, which means that the research process includes not only scientific actors but also representatives of politics, the private sector and civil society" (Renn, 2018).

The research included various phases: a preliminary investigation of the site, current state of the buildings, and context of intervention; a field research, also through the interaction with local administration and stakeholders and the definition of potential users profile, determining design solution and developing the most promising project proposal; the validation of it with stakeholders in order to identify a shared structured brief; development of the proposed draft at the level of a feasibility study. The latter phase deals with the services provided and the spatial layout.

The feasibility study is based on a strategy that reflects the fundamental principles introduced by Italy's *National Recovery and Resilience Plan* (PNRR), which encourages the country to become more sustainable, robust, and prepared for the challenges and opportunities that the green and digital transformations will bring (*Italy's Recovery and Resilience Plan,* n.d.). The first of the principles followed is one relating to the Plan's mission 4 (Education and Research), which gives precise measures for enhancing and extending education and training services qualitatively and quantitatively. In particular has been taken into account, concerning the field of design, the student housing adjustment standards, aim to *lighten* the current legal requirements for common spaces per student in favor of better equipped (single) rooms.

According to Honey-Rosés et al. (2020) the year 2020 may define a *before and after* in terms of planning and design. Certainly Covid-19's impact on public space is expected to be transformative, according to a growing consensus (Stevens et. al., 2021).

This also applies to spaces where the boundary between public and private sphere is very blurred,

such as student housing where the pandemic has brought to light the already-existing issues of habitability, both in terms of private and social spaces. Indeed, student housing “can interpret the idea of a cohesive and inclusive city, by interpreting the role of social condenser capable of acting as an attractive force on young and dynamic users, generating a sense of community and belonging, fundamental act for every project of *mending* of the city” (Bellini et al., 2015).

3. Adaptability as a sign of sustainability

Nowadays cities are reshaping their interactions with public spaces, creating new modalities of communication, social engagement, and interaction. The dissolution of some abandoned places, formerly inhabited, leave behind a spatial legacy that must be repurposed. This is the case of the former military park of Lentate, where the strong cultural heritage identity of the buildings and the growing need for repopulation of these uninhabited spaces, are the designing opportunities that drives the research.

According to these premises, the former military park requalification shows a model of sustainable development based on the “concept of regenerative economy” revealing the “high regenerative potential” (Manzini, 2006) of the project itself.
After serving as a military accommodation, the area is now abandoned, with buildings that are partially damaged and uninhabitable, surrounded by shrubs and brambles [fig. 2]. The interventions designed for the buildings contributed to a significant reconfiguration of interior spaces and a radical change of services [fig. 3]. Three levels of hospitality have been defined, each corresponding to a different purpose depending on the type of user and length of stay. A central aspect is the definition of the services, which can be divided into two intersecting macro-categories: residential services, intended for temporary residents, and community services, open to all.

In order to strengthen relationships between the local community and the temporary residents, the green area has been assigned for shared vegetable gardens where people can cultivate together, stay in touch with nature, and organize events. Community gardening promotes civic engagement and neighborhood ownership, which helps to build a constituency for a policy agenda (Twiss et. al., 2011).

The theme of accessibility is given special attention. The intervention, in fact, calls for the implementation of circulation, adequate space’s layout and dimension to make all spaces accessible and usable by anyone. This is not only considering the current expectation that the residences will primarily serve students, but also expecting that different services, such as those for elderly people, will be integrated in the future.

Public space's adaptive capacity has proven to be limited, due to pandemic crisis (Stevens et. al. 2021) but extremely important; designing transforming spaces also makes them sustainable. This adaptive strategy allows for the construction of a structure with long-term use potential, even if the current conditions will change.
Integrating historic conservation with environmental concerns has become an essential part of a sustainability agenda (Bullen and Love, 2011), therefore design must respect the place, integrate with it, listen to its genius loci (Norberg-Schulz, 1979), it must interpret and be compatible with the place, and increase its sense of belonging, creating meaningful places to help humans to live.

Fig 2. Pictures of the state of the buildings of the former military park in Lentate sul Seveso (Authors' Credits)

Fig 3. Project visualizations: to the left a view of the community vegetable garden, to the right a view of a double room and a shared kitchen (Authors' Credits)

4. Conclusion

The project of requalification of the former military park was designed *in the city for the city*, establishing connections with the territory. A project aimed at enhancing the territory's resources and history, as well as collaborating in the creation of a shared social well-being. “Public space can be understood as a pause in the city’s choreography, which must be able to take care of other requirements besides living, in which the individual and the collective dimension must somehow coexist” (Crespi, 2016).

This paper attempts to highlight the strategic role of design in responding to a new way of life in a post-pandemic society. Aiming at enabling educational and economic development, the expected results of the project are to contribute to the definition of new solutions, in terms of service and spatial design, for disused spaces. Moreover, the design strategy nature includes participatory actions, engagement of local authorities, promoting an exchange of actually enforceable solutions.
While this exchange may limit research innovation by clashing with the project's applicability, it also “has the advantage of being much more effective to enable strategic decisions” (Meroni et. al., 2018), identifying realistic features that can be replicated in a variety of similar contexts.

The strength of former military park requalification lies in the possibility of developing new forms of social and entrepreneurial collaboration by enhancing a process that sees innovation *decentralized* from large urban centers to smaller contexts, which should take the lead role in creating a more sustainable future.

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The man who designed his city.
The Matteotti village in Terni by Giancarlo De Carlo as a socially sustainable method.

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Abstract

The transformation of the consolidated space is a social wound that 21st-century architecture must face. In the European cities dense with buildings, the changing needs of life are always confronted with consolidated urban fabrics formed in different eras. The contemporary architect has to imagine a new city different from the consolidated one in the collective imagination, which, albeit in discomfort, recognizes its value. This is what happened to Giancarlo De Carlo in his project for a district for the TERNI steel mills, which fifty years later is still a virtuous case that has never been repeated in Italy. The visionary project, never fully realized, envisaged the transformation of the peasant settlement Villaggio Matteotti, formerly Italo Balbo, with a self-sufficient micro-city made up of houses and, above all, green spaces, and service for whose design there was a careful listening of the people who should have lived it.

Keywords

Transformation, participation, district, services, micro-city.

1. The working-class district of the TERNI steel mill

The TERNI steel mill founded in 1884 by Vincenzo Stefano Prenda, was initially devoted to the manufacture of war material. In the 1940s, it built a rural district called Italo Balbo for his employees. After the Second World War it converts production into special steels for civil use, making a great contribution to the reconstruction of Italy and changes the name of the district in Villaggio Matteotti. In the period from 1962 to 1967, the company directs its sidero-mechanical processes towards the demand from power plants, experiencing a season of great renewal; it is in this period that, with the impetus given by the drafting of the first PRG of the city of Terni, it decides to renovate the village and take advantage of the greater building density offered by the plan.
The project of the New Matteotti Village was commissioned to Giancarlo De Carlo who currently finds a district with an extension of about 20 hectares divided into 72 plots with a poor urban structure: the lots are connected by eight longitudinal roads and three short transversal ones. On each plot there is a building divided into four apartments, two on the ground floor and two on the first floor. The plot is in turn divided into four parts each serving an apartment.

2. De Carlo's proposal. Five design options and the involvement of a sociologist

In July 1969, De Carlo submitted a document with five design options to the board of the TERNI steel mill (De Carlo, 1969). For each one it provides graphical drawings and descriptions accompanied by pros and cons, in the conclusions a summary table compares the alternatives.

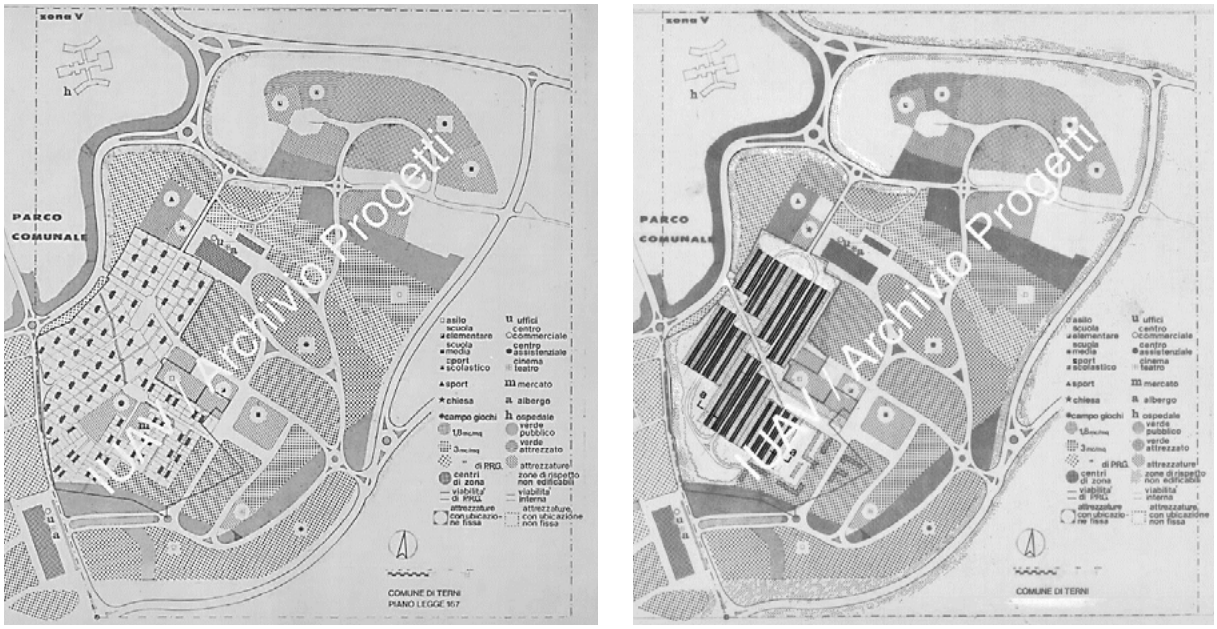

Fig. 1 Comparison between the old Matteotti village on the left and the selected design alternative on the right. (Digital reproductions of the carts. IUAV, FGDC, GDC-pro/054/01)

The first is the only solution that preserves part of the existing village, considering it important for the corporate identity of the company. The renovation of the first four rows of buildings to the west and the demolition of the remaining ones are planned. The second and third alternatives provide for a considerable increase in housing which would pass from 288 to more than 1000. In the first case, the implementation is obtained with eight clusters of ten-storey high tower buildings along the existing roads, in the second, the towers, arranged on the perimeter of the lot, are added four batches of terraced houses absorbed in the greenery of the central part. The fourth and fifth alternatives are inspired by dynamic European models. Both include low housing blocks including services in which pedestrian and vehicular flows are separated. The fourth foresees that the streets are partially underground and illuminated by light wells obtained from the pedestrian slab and leaves the green space to residents or public management, the fifth, instead, raise the pedestrian paths leaving the streets at zero height. Provides open space for each accommodation, privatizing, in fact, the greenery and reducing management costs. Referring to the edge of option four, De Carlo writes: “the practical and psychological comforts necessary for a modern life and a larger and more characterized green space" (1969, p.14). TERNI chooses option five. [fig. 1] In the document proposing the five alternatives, De Carlo explains that he is willing to follow only the last two solutions, suggesting the participation in the project of a sociologist who can relate to users.

3. User involvement

Domenico De Masi is chosen as a sociologist, he, first, takes note of the lack of services and establishes which needs: a nursery school and, in the face of the forecast of population increase, a supermarket and a social center where the new inhabitants can meet and get to know each other. At the same time De Carlo, supported by Cesare de Seta, prepares an exhibition during which projects of virtuous European neighbourhoods selected as examples of new life possibilities will be exhibited and debates will be held with the possible inhabitants of the Village aimed at gathering needs and opinions. [fig. 3] The event takes place in April 1970 and lasts a few days during which some family groups selected from 1366 candidates for the purchase of housing are heard. Those present are in favour of low-rise buildings and are linked to a very traditional concept of home. In an interview released several years later, De Masi says: " The house that came out of these interviews was disheartening [...] because the workers asked for a house very similar to the one, they already had with only a little more tile, a little richer, let's say that all in all they asked for the house of the doctor, of the lawyer of Terni.” (De Masi in RAI SAT art,

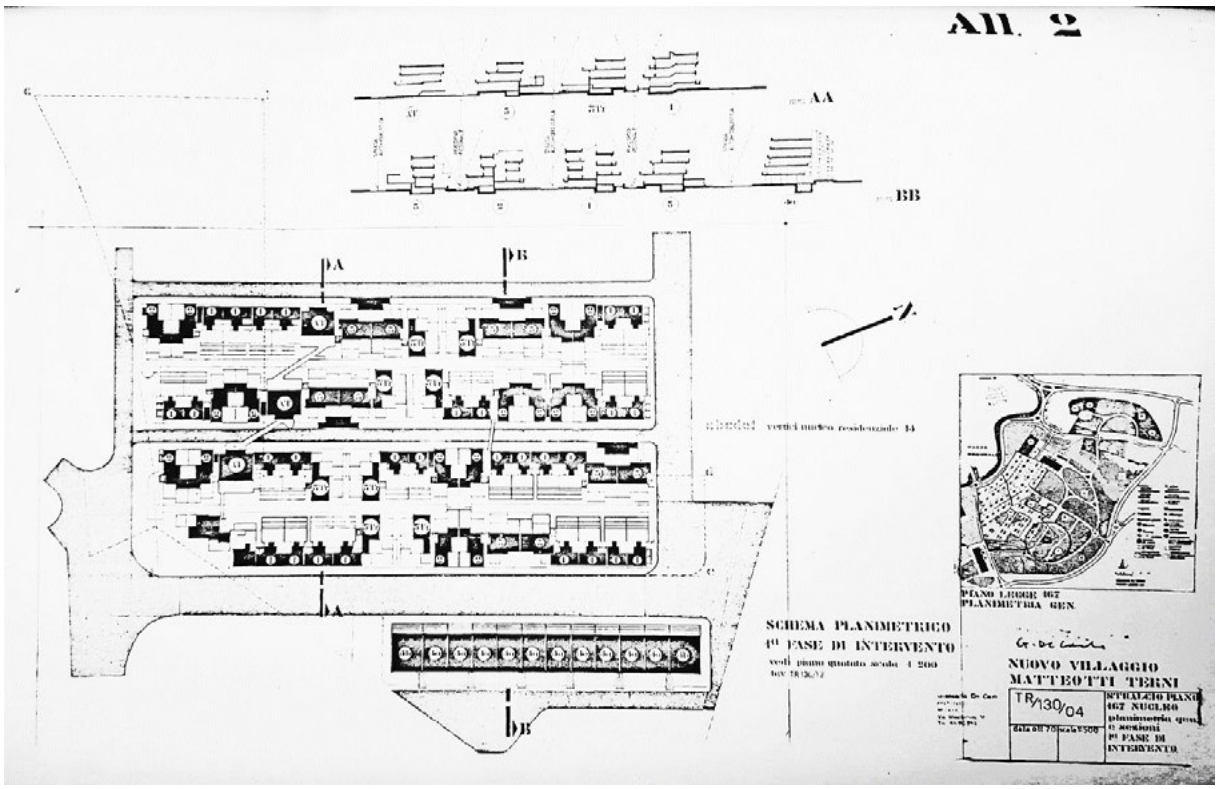

Fig. 2 Planimetric scheme 1st phase of intervention. New Matteotti Village, Terni. (IUAV, FGDC, GDC acts/081, 1970)

2003) Later - October 1973 - another exhibition will be held during which more detailed elements will be discussed and the different types of flat will be presented to users.

4. The project

Following the first discussions with the sociologist, De Carlo presents two project tables depicting two residential areas. To limit the number of demolished houses and thus contain the discontent of the inhabitants, he chooses to start by designing the south-east part of the lot. He designs ten bodies, nine result from a complex aggregation of five types of flat with variations on the three floors for a total of fifteen options; one, instead, consists of a slat with a single type of flat. The ground floor is left for the cars park, while the pedestrian paths are raised by one floor to allow free and safe circulation for adults and children. In some bodies, in addition to housing, there is also a supermarket, a nursery and a social centre connected to each other by an air route that crosses the streets and public green spaces. In addition to these three main services, along the raised pedestrian platform, there are also small settings for commercial businesses and open spaces designed for play or for resting. [fig.2]

5. A new way of living

De Carlo's project remained unfinished both in its physical and research component, in fact, TERNI, after the construction of the first two blocks, was not willing to let the architect continue the work even with the meetings with users.
A few years after the construction of the Village some photos were taken of the interiors of the lived-in apartments that appeared identical to the traditional flats. Critics unleashed a ferocious attack by attributing to this dichotomy the non-acceptance of the project by its inhabitants. The long-time has shown the opposite. Today, more than fifty years after its completion, the New Matteotti Village is in excellent condition, lived in and carefully guarded by its inhabitants. The evolution of taste and the recognition of the value of space are slow processes and the operation that De Masi, de Seta and De

Fig. 3. Second exhibition. De Carlo in the center, De Masi on the left. (S. Egidi, "Un villaggio su misura per questo nostro paese", in "Paese sera", 1973)

Carlo conducted together is the launch of a long-throw seed. As Bruno Zevi (1948/2009) already claimed almost a century ago, the lack of knowledge of architecture and consequently the lack of good architecture must be attributed to those who are unable to educate others. The work described above aims to educate those who are not accustomed to them on architectural issues. It is a tiring attempt, it means identifying oneself with the other, stripping off one's knowledge for a while to understand the point of view of those in front of you, and only then, after understanding the right way to do it, instructing the 'other, “design the client” (De Carlo, 2004, p. 32).

6. Making architecture today

De Carlo's example offers food for thought on making architecture today, not only on the urban scale but also on the small scale. Nowadays, the most successful buildings are those that stand out in cities as objects of art often detached from places and society. This accentuates the dichotomy between magazine architecture, considered the only possible one, and architecture for itself, which is not art, does not exist, and consequently is useless. The example of Villaggio Matteotti demonstrates that tampering with the existing one cannot fail to pass through the active involvement of users who must provide information on their needs but at the same time must be instructed to desire new ones, in a mutual relationship that does not limit to the delivery of the artefact, but of an enriched cultural panorama. We must commit ourselves in the hope of " help architecture to get back to having a point of view and an idea of the world around us" (De Carlo, 2005, p. 29).

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Rereading of the Process of an Idea Competition for Obtaining a Sustainable Urban Environment

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Abstract

This paper mainly focused on an Architectural Competition that aimed to obtain an idea for sustainable urban design project in Ulus, Ankara. An architectural project competition was organized by the Ankara Metropolitan Municipality at the end of January 2022. The title of the competition is "Idea Competition for Ulus 100th Years Commerce Center and Immediate Surroundings". The fundamental reason to organize such a competition is to create a sustainable future for the Ulus, which was begun to be a residual space. To rereading process of this competition is an attempt to conceive why the Municipality choose the term sustainability as the main starting point for the future of the Ulus. Is it enough to use the term sustainability in a competition to save the future of an urban environment? Also, is strategic planning approach made vulnerable all planning processes? The paper will frame and try to dissolve these questions.

Keywords

Idea Competition, Ulus-Ankara, Comprehensive Planning, Strategic Planning, Sustainability

1. Significancy of the Site of the Competition for Ankara

Idea Competition for Ulus 100th Years Commerce Center and Immediate Surroundings is organized in order to obtain an idea for sustainable urban design project in Ulus, Ankara by Ankara Metropolitan Municipality at the end of January 2022. Actually, with this competition, the administration of Municipality aims both to re-function the building, Ulus 100th Years Commerce Center, and to start contribution of creating a sustainable urban environment.

The significancy of the site of the competition stems from both the geographical and the historical contexts. Ulus is one of the most significant urban foci in Ankara, capital of Turkey, with its multi-layered features that could be followed from Phrygians to Republican Period. The competition place is allocated at the south-west corner of the intersection of main axes of Ulus Historical Urban Centre. Its location could be seen as an urban node at the intersection of the Atatürk Boulevard and Cumhuriyet Street. Ulus 100th Years Commerce Center is a bazaar building complex, which includes offices and retail stores with an urban plaza at the ground level. The building has a semantic importance because it was constructed for the celebration of Atatürk's 100th birthday in 1981. The building on site was obtained by a competition that was won by Semra Dikel and Orhan Dikel in 1967 (Annex 1, 2022; Asar, 2012).

The previous administration of the Ankara Metropolitan Municipality decided to demolish the building, Ulus 100th Years Commerce Center, for the sake of renovating Ulus Square in order

to create a psedo-historical urban environment, which not embraced the republican period. However, many initiatives took action to stop this decision and they improved two arguments.

Two important arguments were presented to Ankara Metropolitan Municipality in order not to demolish this building; the first argument was that the building was an important sample of Modernist International Style, which was located young republican city center; the other argument was that it was obtained by a competition like many other building around it. (Acar, 2022) Via these two arguments, Ankara Metropolitan Municipality decided to open an idea competition for this site to obtain a sustainable urban environment which has potential to change immediate surroundings, instead of demolishing current building designed in a process of competition.

After the decision of re-functioning instead of demolishing, organising an idea competition was chosen in order to obtain the best solution to the site. Thus, idea competition aims to change Ulus Square (in Ulus Historical Urban Centre) in a way of both sustainable and comprehensive manner. The current building at the site, Ulus 100th Years Commerce Center, has important features such as permeability and publicity; with these two features it has a capacity to make permanent merge with its own fragmentary urban environment [fig. 1].

2. Comprehensive Plan vs. Strategic Plan

The interesting characteristic of the site –especially Ulus Historical Urban Centre- is that not only it was witnessed all the planning process of the city, but also there was a parallelization with the planning history, which switched from comprehensive planning toward strategic-structural- planning. Just after the 1924 Ankara city map was prepared, the first plan of Ankara was developed by Lörcher, in comprehensive manner. Although the city continues to develop in all directions, the expansion to the south with the guidance of the Lörcher Plan has been determined as the main backbone of the city, and it has been suggested that public investments be made in this direction (Annex 1, 2022).

As a result of the Lörcher Plan being deemed unsuitable, Ankara continued to grow unplanned between 1924 and 1929. In 1929, an international invited competition was held for the creation of the Ankara city plan, and Jansen's proposal was approved and Ankara continued its development in line with the decisions of this proposal plan, without waiting for the plan to be revised and matured (Annex 1, 2022). In 1939, Jansen resigned as his plan had undergone too many changes and did not comply with what was suggested in the plan, and the city was once again unplanned (Annex 1, 2022).

At this point, it is possible to check the weak points of the comprehensive planning; these are to be bounded to one person’s intellectual capacity, non-completeness of information, impossibility to obtain all-inclusive master plan, which comprehends all social interests, unpredictability of the future in a rigid plan, being value laden (Osmançavuşoğlu, 2006, 11).

After the Jansen plan, a new plan competition was opened for Ankara, which continued to develop unplanned for a long time, and the Yücel-Uybadin Plan, which was prepared by Nihat Yücel and Raşit Uybadin, won the competition in 1954. The Yücel-Uybadin Plan was developed as a strategic planning. However, this plan brought with it problems before it could be put into practice due to its erroneous predictions and inability to analyze the current situation

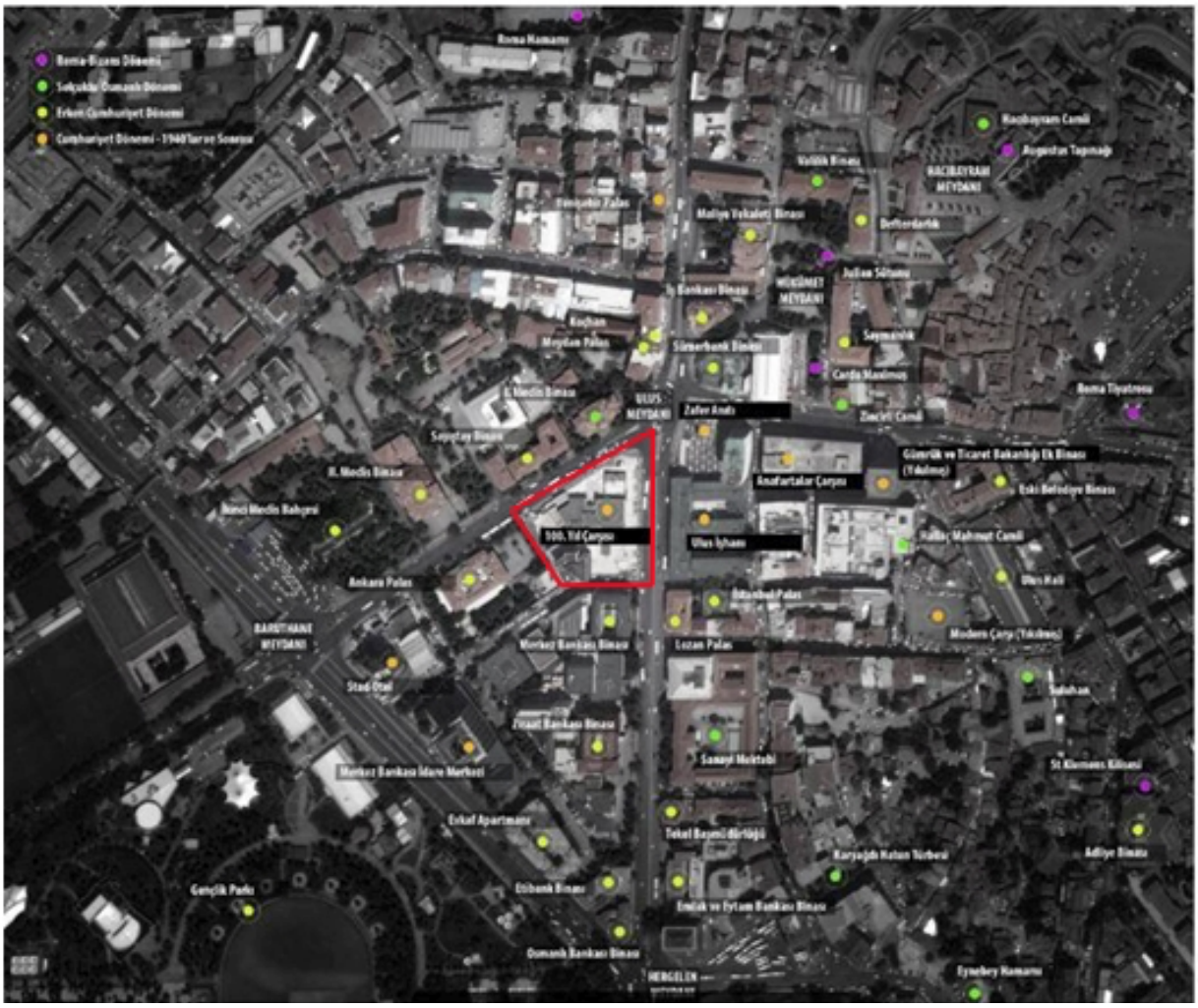

Fig. 1 Ulus Historical Urban Centre (Credits, Annex 2 of Competition Bid, 2022).

Strategic planning, which was originated late 1960s, was capable to response the rapid changes in the planning process of developing countries that had uncertain futures (Osmançavuşoğlu, 2006, 16). Weak points of strategic planning; “difficulty of integration with the regional policies, excessive sensitivity to socio-economic decisions, inconsistencies in application of techniques, delays in taking decisions, uncertainties in determining the targets, difficulties in providing participation and, vacuums in arrangement of infrastructure” (Osmançavuşoğlu, 2006, 18-19).

When comprehensive planning and strategic planning are compared (Osmançavuşoğlu, 2006, 20-22);

- “Strategic planning is more action-oriented, more broadly participative, more emphatic about the need to understand the community’s strengths and weaknesses” (Kaufman and Jacobs, 1987).
- Strategic plans are more flexible in terms of bridging on rigid policy statements and actual decisions.
- “While comprehensive planning often has a substantial vision component, an idealized description of the future state of the place, the visions that guide strategic planning usually involve actors, actions, locals and focuses for action in a participatory manner.”
- While comprehensive planning gives responsibility to governmental bodies, strategic planning is guided by public/private entities.
- Strategic planning is more adaptable to the “reformulation of policy development”, while master plan is an envisaged long term vision for implementing land-use decisions.

- The scope of plan is another significant difference; while comprehensive planning is limited to physical conditions, strategic spatial planning has a wider range approach on socio-cultural, political and economical issues.

3. Conclusion

Although strategic planning is “flexible, adaptable to changing circumstances, action oriented, open to negotiation by various actors involved in the planning process and allowing participation by beneficiaries of the planning process” (Osmançavuşoğlu, 2006, iv), it can easily be manipulated by governance (by power). If the power have not tendency to be participatory, then strategic planning makes capable the power more powerful on decision making processes. The claim is that the characteristics of Strategic plan, which was improved for Ulus Historical Center Conservation, made it more fragile and vulnerable. This vulnerability could not be solved by only opening an Idea competition that tries to obtain a sustainable urban environment. It needs more comprehensive approach.

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Urban environments regeneration. Technological issues for adaptive re-use

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Abstract

The technological approach to the regeneration project of urban contexts is strongly oriented to the quality of living and implies approaches that pursue, on the one hand, environmental and energy objectives, and on the other, conservation and enhancement of the existing heritage according to the inseparable combination of "environment and innovation".
In this transformative scenario the public space and, in general, the open spaces, play a strategic role, already covered traditionally within the city system as nodal elements not only in relation to usability and comfort but also to cultural identity, thus giving an added value to the urban fabric itself.
In relation to the different functions attributed to the urban open space, an application case study is presented that focuses attention on climate-adaptive design approach, based on microclimate simulation for urban modelling.

Keywords

Urban ecosystem, urban open spaces, ecosystem services, urban heat island.

1. Introduction

Demographic, economic, and cultural changes are increasingly inducing territorial policies to privilege the recovery of the existing in a qualitative way, leading institutions to concentrate resources on the regeneration of the urban environment.
To intervene in urban development to find an alternative to the traditional linear model, regeneration must be approached from the perspective of sustainability, pursuing quality of living, and imagining new roles that not only the built environment but also the connective tissue can assume.

2. Adaptive urban transformations [RF]

The improvement of the environmental conditions of the urban habitat is currently at the center of attention of both local and larger-scale policies, for example it is also one of the central themes of the "National Recovery and Resilience Plan" that is part of the "Next Generation EU programme".
The objectives of the 2030 AGENDA for sustainable development have already constituted an important reference for thinking about the actions to be taken for the development and transformation of our cities which are increasingly configured as agglomerations with great complexity (Borsacchi, 2020).
The challenge is precisely this: can cities become capable of environmental self-regulation in order to ensure the control of transformation and the achievement of the Goal 2030: "11-Sustainable Cities and Communities"?

Fig 1. Urban analysis and project concept (Federico Bocchini, Luca Della Rosa, Marco Salvatore Santone, 2019)

Furthermore, the period of pandemic crisis has highlighted the need to equip cities with open spaces as one of the key points of contrasting the contagion was precisely that of privileging the use of outdoor spaces over indoor ones and of implementing the social distancing which is much easier to achieve in open areas.
It is clear that there is an emerging need for a reconfiguration of urban areas that pays attention to the adaptive capacity of places (Gianfrate & Longo, 2017) in order to calibrate appropriately interventions with the maximum capacity for environmental sustainability.
In this regard, starting from the qualitative and quantitative analysis of flows, that is, how people move, how they relate, how energy uses are supported, how supplies and services are organized, it is possible to characterize the urban environment and hypothesize regeneration interventions that have the aim of making the flows compatible with the sustainable transformations of the environment in which they are located.
Subsequently, in order to structure the intervention of regeneration of the urban environment, the aspects, often interrelated, that need to be controlled are primarily: the proper management of the urban water cycle, the creation of permeable surfaces, the provision of green areas both functional and equipped, the treatment of waste as management of the disposal system, the limitation of vehicular traffic flows and the encouragement of alternative transport systems, the limitation of emissions that cause noise pollution and those that generate air pollution.
In addition to the control of all these aspects, it is also important that the intervention establishes relationships both with its surroundings both natural and anthropized. The regeneration intervention thus understood has the objective of qualifying life, protecting health, increasing safety, promoting the interrelation of the inhabitants. Structured in this way, it contributes to increasing the carrying capacity

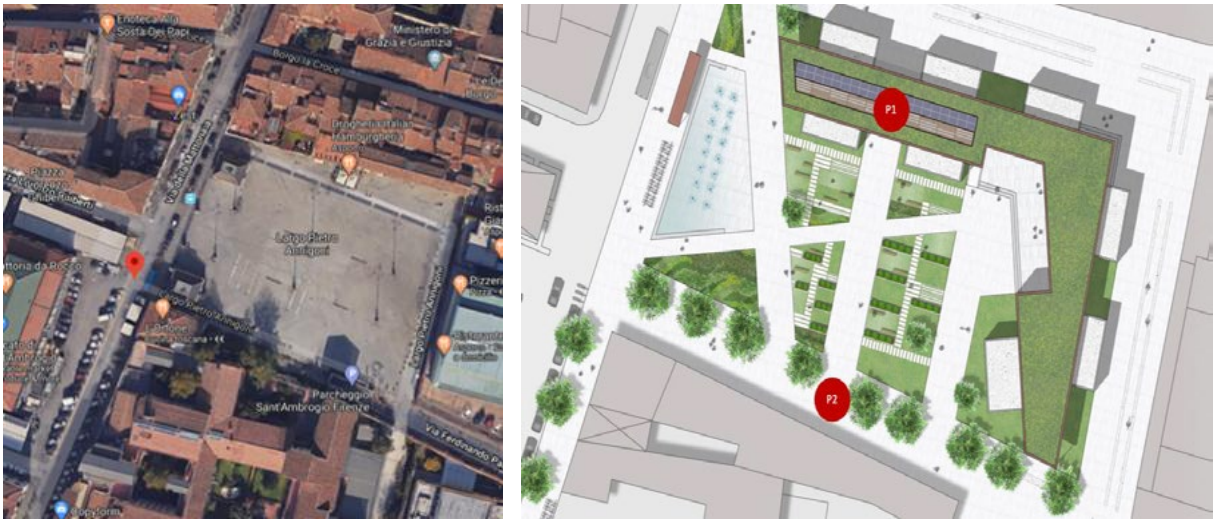

Fig 2. The square before and after renovation (Federico Bocchini, Luca Della Rosa, Marco Salvatore Santone, 2019)

of the city which can be defined as the ability to absorb and control urbanization phenomena with a sustainable impact on the ecosystem.

3. Open spaces as urban "infrastructure" [CF]

The progressive loss of *environmental knowledge* and the abandonment of care by settled communities have contributed to increasing various forms of degradation (Magnaghi, 2010), including social degradation induced by the deterioration of living conditions, which contribute to undermining the balance of urban eco-systems. In order to respond in a tangible way to such forms of degradation, it is necessary to introduce actions to adapt urban systems so that they increase their adaptive capacity in situations of anthropogenic and environmental criticality attributable to the well-known technological, socioeconomic and environmental aspects (Gianfrate & Longo, 2017).
Considering our cities as organisms and, therefore, not as linear but as circular systems, should be the common denominator of such transformative actions. Sharing, among other things, the idea suggested by McDonough (2017) of the city as a "positive force", a scenario is configured in which working on urban environments means adopting strategies oriented not only to reducing negative impacts but, above all, to activating mechanisms to improve the quality of living.
The organisational system of open spaces, as an expression of the quality of living in a specific context, should therefore respond to precise functional needs dictated by modes of collective life increasingly oriented to a growing flexibility by putting into system many aspects (from the recognizability of surfaces to the comfort of spatial elements) according to an integrated approach to the project in which the technological and environmental dimension necessarily intertwines with the social one (Mareggi, 2020). Applying the concept of "positive force" to the dynamics of urban regeneration according to a technological approach to design, it is possible to identify in the redevelopment of urban open spaces an opportunity not only to increase the quality of individual spatial elements but also to activate processes of revitalisation of the city itself, both from an architectural-environmental and expressly social point of view, especially in contexts where these balances are compromised.
Interpreting urban open spaces as a systemic network in which connections play a key role in influencing modes of use and promoting new forms of urban cohesion (UN-Habitat, 2016) is an increasingly pressing need, especially if we focus not only on "acquired" functions (from accessibility to safety) but on so-called "ecosystem services" (Waldheim, 2006; Sun & Chen, 2017). Issues such as the stormwater management, the combination of innovative technologies for mitigation and adaptation to climate change (as showed in the case study proposal) and the identification of habitats for wild plants and animals, assume in this scenario a key role to increase the accessibility and usability of open spaces,

accentuating their role as urban infrastructure able to contribute to the improvement of microclimatic conditions in terms of mitigation and adaptation (Gianfrate & Longo, 2017).

4. A case study proposal [PG]

Based on these considerations, a design methodologies and technological solutions was developed to support a design proposal for the deep regeneration of an Italian urban area located in Tuscany, as case study, both in terms of reducing exposure to climate risks (Urban Heat Island and heatwaves, water and flooding deficiencies,) and in terms of economic sustainability and social inclusion.
A climate-adaptive design approach, based on microclimate simulation for urban modelling, was developed as a tool to stimulate the urban regeneration of urban neighbourhoods, with a particular focus on the effects due to the combination of innovative technologies for mitigation and adaptation to climate change of the Italian historical districts.
As a case study a square in Florence was chosen to practical experience in the frame of a post graduated Master Course in Architecture Bio-ecologic and Innovation Technological for Environment, to analyse with the students the outdoor comfort of a specific urban space. The design proposal was inspired by a holistic approach finalized to improve the resilience of the Florentine square, starting from a first analysis carried out on the identification of its social and environmental features. Attention was paid to preserve its historical urban configuration and its relations with the surrounding areas, enhancing the square's ability to react to the phenomena of climate change [fig. 1].
The scientific work was articulated with a preliminary analysis of urban geometry factors urban fabrics and climatic, following by analysis of urban open space uses, based on different patterns of spatial occupancy and considering specific users profile depending on the season and on the different time of the day.
Some representative microclimatic indicators were thus identified for pedestrian and urban characteristics together with the urban and building characteristics that most influence the local microclimate, such as physical properties of materials, morphology of the urban fabric, mitigation.
With this data, a pre-processing of the geometric and physical model of space and simulation of microclimate conditions (using a software ENVI-met for urban modelling comparing indexes of environmental comfort), was elaborated together with UHI simulations of the square urban climate, before and after the previous renovation. Thus, in order elaborate a design of a suitable project with identification of the most effective technological strategies, in terms of mitigation of the urban heat island, overall improvement of thermal comfort and urban microclimate [fig. 2].
Design proposal was focused on the definition of new urban spaces, where a new antique market and other social infrastructures were located to improve the outdoor comfort and the environmental performances of the urban district and to increase its social potential as aggregative space [fig. 3].
In detail the square was repaving using local materials with a high albedo and a low Solar Reflectance Index (SRI) and a new market building was constructed covered with a wooden solar shading structure where integrating technologies to produce renewable energy and to collect rainwater. The retraining of the nearby streets, transformed in green corridors with addition of design of water elements, like fountains, to increase the outdoor comfort especially in the summer months; a rain garden concludes the project to decrease the overall amount of water entering local storm sewers or surface waters to reduce flooding related impacts. The vegetative species integrated into the green areas of the new square were selected from native species according to the phytoclimatic and bioclimatic characteristics of the study area considering mild and no allergenic species; a balanced use of evergreen and deciduous trees to enhance seasonal water regulation; permeability of foliage for radiation control; seasonal adaptability and maintenance.

Fig 3. The view of new playground area (Federico Bocchini, Luca Della Rosa, Marco Salvatore Santone, 2019)

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A Scattered Courtyard: rediscovering the Historical Palimpsest of Xi'an for regenerating the urban texture along the City Wall

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Abstract

Chinese Empire Capital for dynasties and terminus of the Silk Road, Xi'an has known moments of greatest heights that have left permanent traces in the city evolution. Because of both government policies and urban modern necessities, the historic centre of Xi'an has lost nowadays its role of urban core to a reckless decentralization that will reach its peak with the merging of the Xi'an and the nearby Xianyang municipalities. The urban strategy proposed aims therefore to counter these decentralization phenomena pointing out the signs of the City historical palimpsest, unrecognizable nowadays, combining urban rediscovery with contemporary social needs. The proposed urban design operate a regeneration of the linear fabric that develops adjacent to the Ming City Wall in the Zhuque Gate area, undergoing a rewriting operation. A linear sequence of scattered courtyards, which reinterprets the Shaanxi traditional typology of the Shieyuan, reveal the memory of the place by returning a view of lights and shadows in motion.

Keywords

Xi'an, Historical palimpsest, urban regeneration, rewriting, courtyard

1. Introduction

Capital of the Chinese empire for several dynasties and terminus of the Silk Road, the city of Xi'an has experienced moments of great splendour that have left indelible traces in the evolution of the city.
The proposal project here presented starts from these traces, developing the urban regeneration themes in two steps, a strategical phase and a compositional one. The project has also included a preliminary investigation trough an analytical research. It has been developed between 2015 and 2017 and proposed in occasion of a Sino-Italian Double Master's Degree thesis between Polytechnic of Milan and Xi'an University of Architecture and Technology, under the supervision of Prof.ssa Laura Anna Pezzetti, Prof.ssa Francesca Battisti (POLIMI) and Prof. Li Hao (XAUAT), final discussion April 2018 (a.a.2016).

2. Xi'An in History: the ancient Capital system and its Monumental Axis layout

The first phase of analysis investigated the historical macro-urban development of Xi'An City through the different Imperial Dynasties, starting from the Western Zhou Dynasty (1046 BC - 711 BC) to the Qing Dynasty (1635 AD - 1911 AD) and to the modern time [fig.1].
Starting from a cartographic research, it has been noted how the morphology or, better, the morphologies of the city, refounded from time to time in the Wei River valley area by the ascending dynasty, have always been generated in harmony and interaction with territorial structures developed by monumental axes. Outside the borders of the city, consisting in its defensive walls, these axes refered to natural elements, such as valleys and mountain ranges, or monumental landmarks. Inside the defensive walls, the course of these same axes divided the urban fabric into a grid, shoring up its path of religious monuments, temples and monumental gates.
In the Tang era Empire (618 AD - 901 AD), the capital took the name of Chang'an.

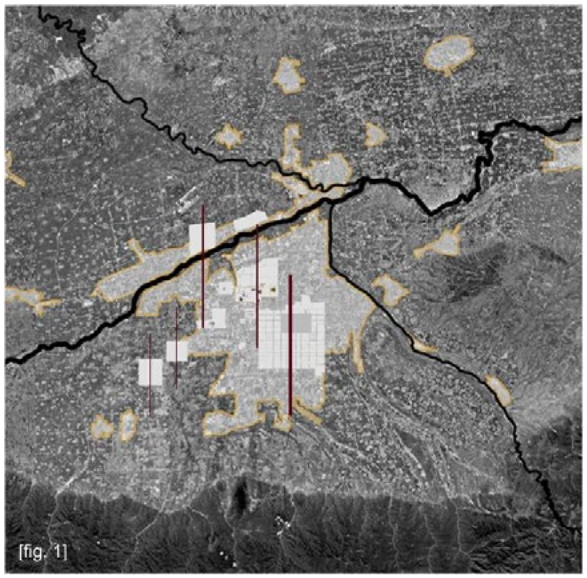


Fig 1. Development of Xi'An City through the different Imperial Dynasties (M. G. Atzeni, "A scattered courtyard: glimpsing at space", DMD thesis POLIMI-XAUAT, supervised by Prof. F. Battisti, Prof. L. Pezzetti, a.a. 2016), 2022

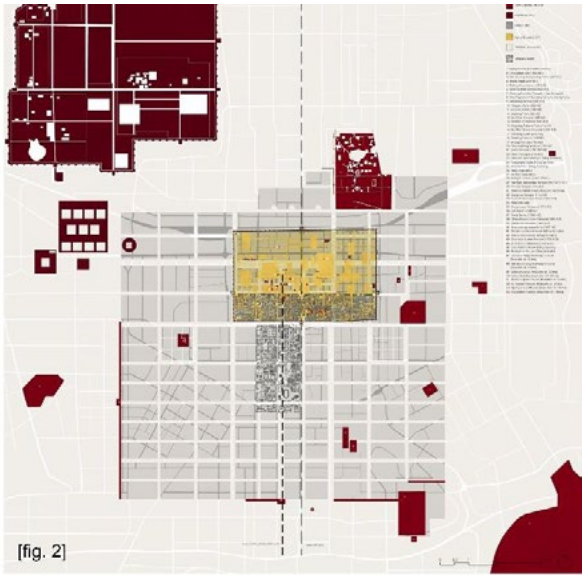
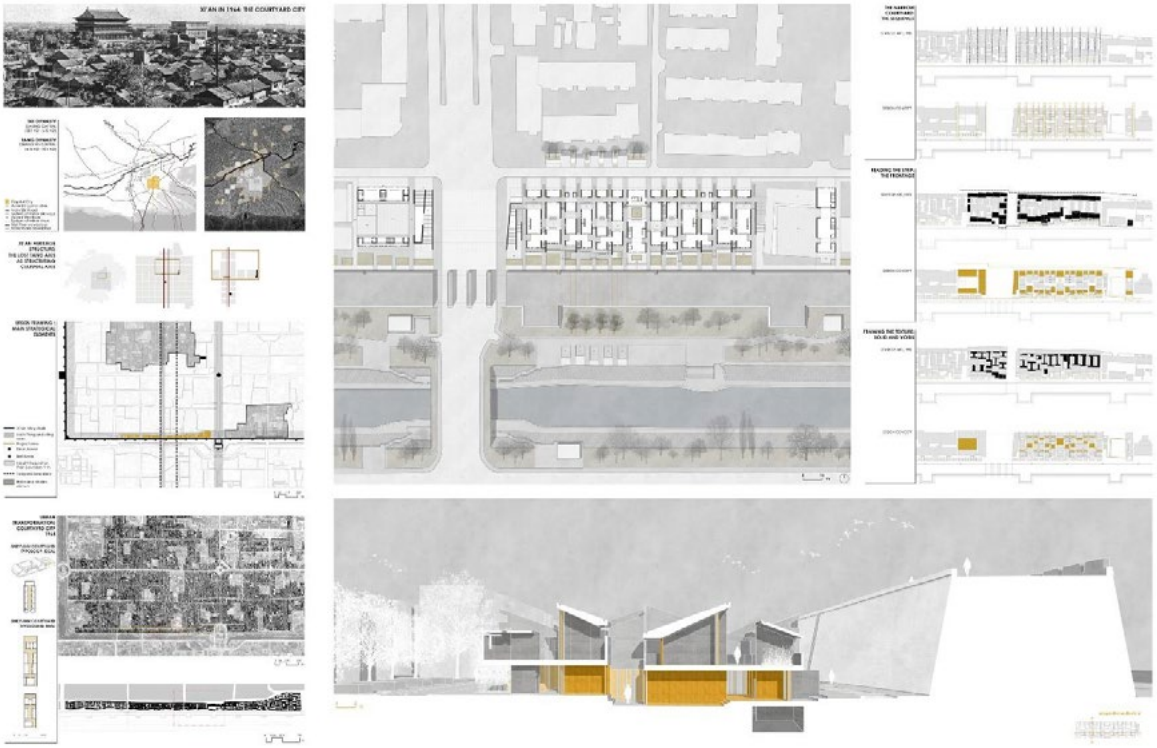


Fig 2. Urban Strategy (M. G. Atzeni, "A scattered courtyard: glimpsing at space", DMD thesis POLIMI-XAUAT, supervised by Prof. F. Battisti, Prof. L. Pezzetti, a.a. 2016), 2016

The territorial axis that determined the position of the capital in its territory took the name of Zhuque Axis. In the territorial asset, this ideal axis took as reference the Longshan Mountains to the north end and the Zi Wu Valley to the south end. Within the city, the axis determined the course of the Zhuque Avenue, the central and most important road of the capital, also known as Silk Road.
The structure of the city was also determined by the presence of the Lifang, large blocks of the size of one Li per side (about 500mt), surrounded by a low rammed earth wall and by a moat. The streets system was hierarchically divided into primary and secondary ways.
At the very north end of the Zhuque Avenue is located the Zhuque Gate, entrance to the Citadel of the Officers and, further north, the Imperial Citadel.
After the deposition of the Tang Dynasty in 901 A.D., the main monuments of the Imperial City, such as the Imperial Citadel, Zhuque Avenue and the Lifangs were destroyed, according to the Chinese tradition. For defensive reasons, the city, no longer capital of the Chinese Empire, moves entirely within the walls of the Tang-era fortified Citadel of Officers.
During the Ming era (1368 AD - 1644 AD) the city adopted the name of Xi'an. Following a flourishing economic development, the city expanded the existing defensive walls to the north and to the east sides, maintaining the existing walls on the south and on the west sides.
The city, thus surrounded, developed itself from now on as an *Inner City*, no longer determined by macro-urban territorial structures but rather the substratum of itself.
From this time on, the territorial structure and name of the city will remain constant until the modern age (Qing Dynasty).

[tab. I]

A SCATTERED COURTYARD: GLIMPSING AT SPACE _ Rediscovering the Historical Palimpsest of Xi'an for regenerating the Urban Texture along the City Wall _ Dott. Maria Giulia Atzeni



Tab. I. A scattered courtyard (M.G. Atzeni, "A scattered courtyard: glimpsing at space", DMD thesis POLIMI-XAUAT, supervised by Prof. F. Battisti, Prof. L.Pezzetti, a.a.2016), 2022

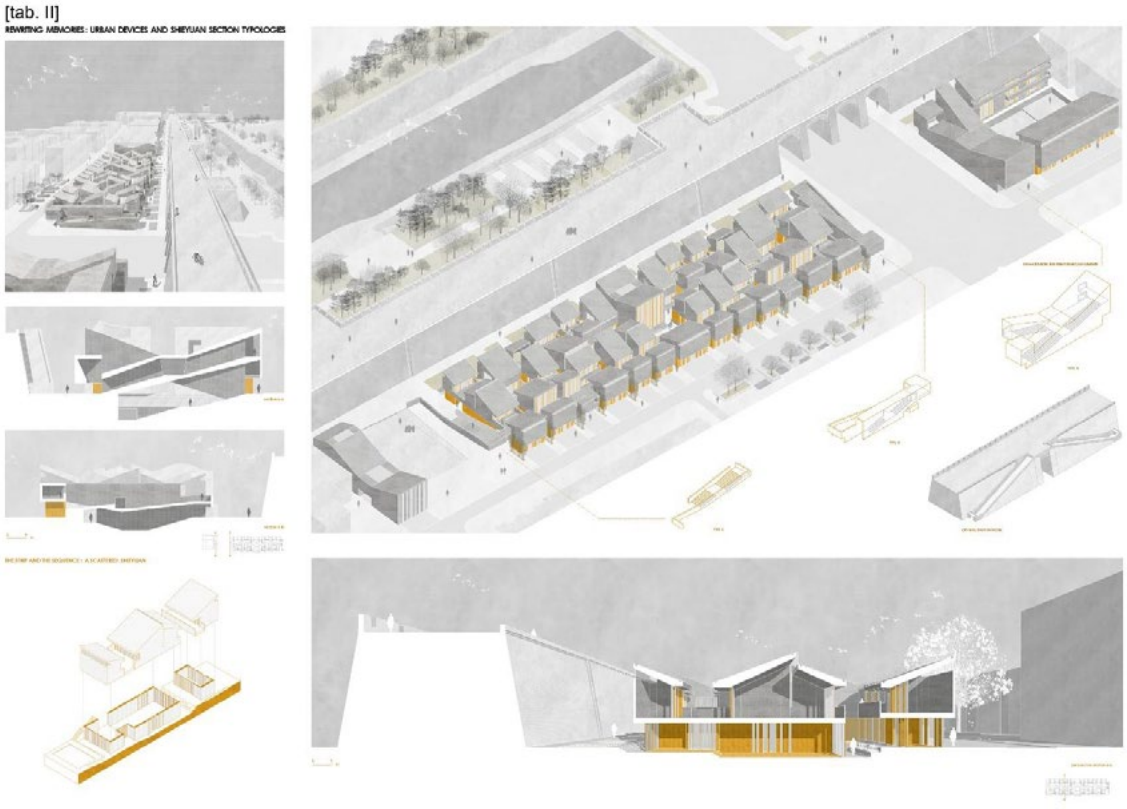
3. The Urban Strategy: the lost Tang Axis as a structuring Cultural Axis

The urban strategy constitutes the preliminary phase of the project [fig.2]. It aims to bring to light the signs of Tang Chang'an Imperial City, which today lies almost invisible in the folds of the urban fabric.
The axial development of the ancient Tang Chang'an Capital City has become the cornerstone of the urban strategy. The hypothesis presented proposes to give back to the nowadays Xi'an, biased towards a wild decentralization to the north-west towards the Wei River and the nearby municipality of Xiangyang, a strong axial urban element that followed the course of the ancient Zhuque Axis.
This operation has a dual purpose. First, to recalibrate the barycentre of the city in favour of its historic centre, counteracting the ongoing north-west expansion. Secondly, the new cultural axis proposed aims to reunite one of the most important monuments of the Tang era, the Little Wild Goose Pagoda, UNESCO site since 2014, with the most important monumental sign of the Ming era: the City Wall, which it contains within it the oldest existing layer of urban building to date.

4. The *Inner City* rewriting: a linear sequence of scattered Courtyards

The second phase [tab.I-II-III] focuses on an urban regeneration project on the Inner City, enclosed by the City Wall of the Ming era. The chosen intervention site consist of the linear fabric that develops adjacent to the south-west end of the City Wall, in the area that surrounds the Zhuque Gate. An extremely significant place in the history of the city, as this gate was the main entrance to the Citadel of the Officers during the Tang Empire.
The rewriting operation is undertaken on a series of linear buildings dating back to the 2000s, still recognizable despite the large transformations of the last two decades. This overall area presents

nowadays three main critical aspects. First, the absolute lack of permeability between the south front, facing the City Wall, and the north front, facing the Inner City, due to the compactness of this linear fabric. Second, the lack both of public or private services on the south front facing the City Wall, which is the reason of the inactivity of this front both by day and by night. Third, the overall poor quality of the fabric itself, made from an assembly of heterogeneous, hardly recognizable parts.
The project involves an initial grafting operation on the warhead of the linear building that develops west of the Zhuque Gate, maintaining the originality of almost the entire linear body. The space is that of a large courtyard which relates to the urban scale, marked by a monumental staircase on the street front, which dialogues with the compactness of the Zhuque Gate.
East of the Zhuque Gate, the rewriting operation reveal the traces of a more minute fabric, made up of traditional Shieyuan, which until the 60s animated the skyline of the entire Inner City. Reinterpreting the typology, the project proposes to develop a linear series of scattered couryards, restoring to the contemporary a complexity and a spatial poetics that can finally dialogue in harmony with the monument of the City Walls. The settlement strategy starts from an architectural map of 1990, which reproduces the morphology of the pre-existing courtyards in the original sequence, becoming the trace of a new widespread and interconnected system: scattered, as it were. In a first operation, the boundary walls that originally separated one Shieyuan from the other become urban passages. The new permeability between the southern front, overlooking the walls, and the northern one breaks the block without fragmenting its unitary image. These passages, now equipped with ramps now with steps, become here and there climbing elements, elsewhere green elements. The second operation starts with the study of the two fronts. On the southern front, along the city walls, the Shieyuans originally developed with a sequence of private yards. Separated one from the other by thin boundary walls, these gardens ended almost in adherence to the City Wall. The proposed design theme is a garden front, jagged in the sequence of volumes, regularized by the areas of greenery and public paths, which emphasize the sequence of the courtyards. The pavilions that here overlook, immediately accessible at a higher level from the street by a sequence of staircases, have been designed as precious accessories to the green elements. On the north front, towards the city, the original sequence of Shieyuans showed a continuous and compact line, with pavilions of almost equal size and depth. The theme proposed for this front favours an artisan vocation alternating, at the street level, different sales rooms, interspersed with thin tongues of green. Artisan workshop spaces are located in the set back pavilions, providing adequate work and storage spaces. An elevated level (+3.50m), which can be reached from the north front with dedicated lifts, constitutes a continuous flotation level between front and the back pavilions. Designed as a circuit, it is dedicated to the temporary exhibitions held by the hosted artisanal and artistic realities.
A third operation is based on the study of solids and voids in the original Shieyuan sequence. The study of the different units led to a typing of these sequences. After a first phase of geometrization, six section types were defined, plus a special and variable seventh (hall typology). The project sequence alternates the sky-earth voids of the Shieyuans, allowing a longitudinal crossing of the entire block. This crossing passage constitutes a significant level, an excavation level (-1.00m), shared by many pavilions, in a continuous indoor and outdoor space. The place is that of a diffuse room, open and covered, equipped with steps for sitting and elements of green. An open and lowered space is located at the end of this urban system: a lowered plaza (-0.50m), in size and proportion comparable to the urban courtyard at the west of Zhuque Gate, closed to the east by a tail element of the Shieyuan sequence: a special hall type for public conferences.



Tab II. Rewriting memories: urban devices and Shieyuan section typologies (M.G. Atzeni, "A scattered courtyard: glimpsing at space", DMD thesis POLIMI-XAUAT, supervised by Prof. F. Battisti, Prof. L.Pezzetti, a.a.2016), 2022

5. Conclusions

All the operations undertaken in the various design phases can exemplify a general urban strategy approach, consistent with the studies carried out on the historical evolution of the site to the Chinese vernacular architecture, and it is therefore applicable to regenerate other areas on the urban fabric that develops along the perimeter of the City Walls.

Tab III. Rewriting memories: passages typologies and construction details (M.G. Atzeni, "A scattered courtyard: glimpsing at space", DMD thesis POLIMI-XAUAT, supervised by Prof. F. Battisti, Prof. L.Pezzetti, a.a.2016), 2022

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Second-hand Architecture. For a new theory of reuse. The case of the EX IDAC FOOD

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Abstract

Since 1973 there has been an abandoned place along the Domitiana state road, a body of more than seventy meters high which houses a factory for the freeze-drying of agricultural products. The former Idac Food of Mondragone, which today takes the name of "Torre di Mondragone" because of its height related to the predominantly agricultural and horizontal territory, was the case study of a degree thesis that focused on the hypothesis of a second-hand architecture imagined by emptying the pre-existing structure and reusing the structure still in good condition with the aim of giving a second chance to an architecture that has become a symbol of decay and abandonment. The built environment is one of the major culprits of ecological policies and the aim of this work is to try to transform it into a device for reinterpreting the environment through the adaptation of the form to the conditions of the present.

Keywords

reuse; bare; green; reuse; concrete

1. Introduction

> Re-employment (less com. re-employment) s. m. [der. to re-employ] (pl. -ghi). - Employing or being employed again, new employment: r. of a capital, of the accrued interest; to seek, to find a re-employment. With sign. partic., in economics, in the plur. re-uses, the part of the goods and services produced in each period that is reused in the production process, replacing the goods and services consumed in the production of the aforementioned period; and in architecture, parts of r., the architectural parts belonging to older buildings and then used in more recent constructions, according to a once widespread practice (Italian Treccani Dictionary)

Reuse is an ancient practice, just think of the material coming from the dispossession of buildings that has characterized a whole tradition of spaces made famous today by the mix of presences from the past in symbiosis with the current time. The pre-existence became an element from which to steal precious parts that enriched the present and this action has characterized the entire history of architecture; today we have evidence of how the past appeared as an element to be retained in the present, a compelling tale of elements that flowed into the same space made magical and invaluable precisely by a relationship of narrative continuity.

Behind this action, however, there were practical needs due to the cost of the raw material and the transport difficulties that laid the foundations for the practice of re-use. The city of the present, the result of superfetations and additions, is the scenario in which to imagine a new theory of the bare understood in a contemporary sense.

The built environment is, in fact, one of the major defendants of ecological policies precisely in relation to the CDW Construction and Demolition Waste, so much so that the European Union has issued a protocol for the management of construction and demolition waste, the EU Construction and Demolition Waste Protocol and Guidelines (UE Directive, 2018), setting the recycling of waste equal to 70% as a goal for 2020. The presence of buildings that can have a second chance is the real challenge for contemporary architecture (Coelho, A., & De Brito, J., 2012) and the aim of this work is to describe one

Fig 1. Planimetric view (Serena Tibaldi, 2018)

Fig 2. The New Tower (Serena Tibaldi, 2018)

of the possible strategies in a complex and degraded territory such as the Litorale Domitio where abandoned works exist in which the structure it still appears usable but only needs a second chance (Gambardella, Ch., (2021).

In 2021 the Pritzker Architeture Prize was won by Anne Lacaton and Jean-Philippe Vassal, an architecture firm that has put the updating of dated infrastructures at the center of its project theory, allowing the building's properties to be preserved (Druot, F. Lacaton, A., & Vassal, J.P. (2007). The action of demolition appears, for the French studio, a real act of violence, a waste of material and a waste of history and this orientation becomes the guiding thread of the research carried out in the project for the re-functionalization of the EX Idac-Food of Mondragone.

The research conducted by Frederic Drouot, Lacaton and Vassal in 2007 with “Plus. Les grands ensembles de logements. Territoire d'exception "was, in fact, focused on the idea of the residual method with which to manipulate the pre-existing architecture through actions of transformation of the existing. The research center was based on comparing the cost of demolition and functional reconstruction of five cases: Aulnay-sous-bois, Le Havre, Nantes, Rouen, Trignac. From this research it emerged that it was much more convenient to work on the existing heritage as the costs of demolition appeared exorbitant. With the competition held by the Offices Publics de l'Aménagement et de la Construction in Paris for the Bois-le-Pretre tower, what was theorized in the Plus principle is put into practice.

The Bois-le-Pretre tower project, inaugurated in 2011, structurally and architecturally manipulates the organism and can be considered the Manifesto to refer to when it comes to zero demolition. If the project by Drouot, Lacaton and Vassal is undoubtedly a symbol of the possibility of designing with little and zero waste, also the DeFlat project by NL architects and XVW architectuur in Amsterdam has assumed a reference role in the analysis of the possibilities of EX Idac Food of Mondragone especially in relation to the possibility of controlling the design process by future users. In fact, the project was based on the idea of giving the owners the opportunity to renovate their accommodation by transforming it into a "Klusflat", a concept that earned the two studios the 2017 Mies van der Rohe Prize.

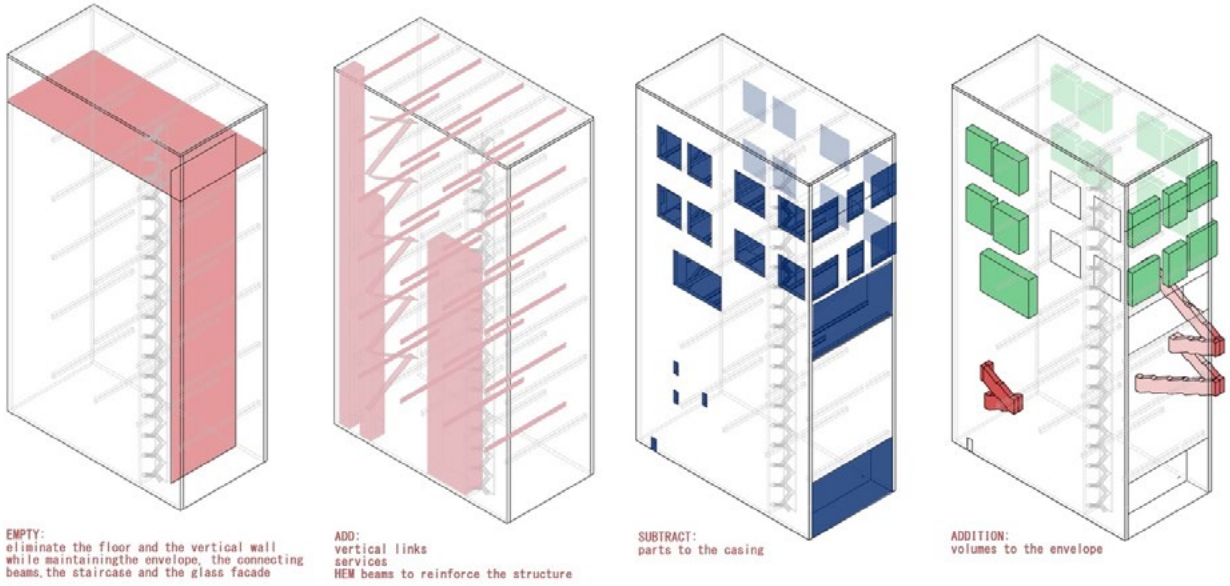

Fig 3. The parts of the project (Serena Tibaldi, 2018)

2. Contemporary urgencies: sustainability and minimal action at Mondragone

The need to design based on the idea of zero waste appeared for many years only a utopia until the major international institutions were confronted with the data on the amount of building waste material (Simion M. I., Fortuna M. E., Bonoli A. & Gavrilescu M., 2013, pp. 273-287).The European guidelines on the protocol relating to the Demolition of the pre-existing place, in fact, place the built environment as one of the major defendants of ecological policies. A new theory of remembrance may be the key to the environmental rebirth of composition. The action of "building on the built" not only limits the presence of waste and lifeless substances but becomes an extraordinary support crutch for a new profile of building. The area of the EX Idac-Food in Mondragone, the study area chosen for this work, contains within itself a series of environmental but above all social and economic problems.
Inserted in a purely agricultural fabric, the “Tower” imposes its presence in an overwhelming manner on the horizontal territory of the Domitiana State Road. The object today appears as a relic of industrial archeology and its presence declares the laxity of years of lack of economic-political strategies for the area. The Municipality of Mondragone is inserted in the province of Caserta and has a geographical position that allows the territory to be lapped by the sea and to have numerous places of naturalistic, as well as archaeological and monumental interest. The flat area allows the territory to be a perfect device for the development of flourishing agriculture and, precisely because of this characteristic, the IDAC FOOD factory chose to place their headquarters for the freeze-drying of agricultural products in the lush and fertile territory of Mondragone.
If until 1973 he had given work and money to the Mondragone area, once the economic system entered crisis, the architecture of the structure appeared as a further problem to be faced without, however, reading its potential. The thesis project in Architecture and Design for Autonomy at the Department of Architecture and Industrial Design developed with the student Serena Tibaldi starts from the consideration that the structure of the building, more than seventy meters high and with a size of plant of twenty meters by forty, can be considered as an element of stripping of the recent past of the territory and that what still had an architectural and structural value would have been the basis for the choices of a new project. By demolishing only, the damaged and no longer usable parts, the project focused on the elimination of the floor and the only vertical wall while maintaining the envelope, the connecting beams and the ventilated facade.
In addition, vertical connections and HEM beams were planned to reinforce the structure while the activities were spread over five levels. The ground floor houses the reception while on the first level the project inserts an area dedicated to art exhibitions precisely to bring the space of culture back to the center in a place far from the art circuit. On the second level we find a gym that could become the

catalyst for young people so as to find a new goal beyond crime in the body's balance. On the third level, a refreshment area offers zero kilometer tasting of the area's typical products. On the fourth and fifth levels, the insertion of housing aims to create a vertical village that can contain within itself the spaces necessary for the community to redeem the dark image that could permeate the object in its previous form. The multifunctionality of the building wants to be its new vocation, to welcome and not reject, to envelop and not to break in, a second opportunity to imagine a contemporary reuse.

3. Conclusions

This work aimed to reinterpret a space, a symbol of decay and abandonment, imagining it as a device capable of reconnecting a territory to its original role. If the "Tower" has been a symbol of work and a thriving economy for years, the project focused on the idea of repositioning the element as a landmark with all the elements useful for self-sufficient architecture inside.
The desire to emphasize the pre-existing structure by interpreting it as a new bare has made it possible to reduce the demolition material to a minimum and enhance the situation.
The idea of Second-hand architecture is the central theme of the research behind this project which allows to reduce waste material to a minimum, enhancing the structure still in good condition and working in addition to the structural elements necessary for the static problems of the building. A contemporary reuse that focuses on the past, reworking it through the eyes of the future.

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Resonant void. Play and interaction in architecture

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Abstract

The transition from the smart city to the open city thins public and private space division. In the last decade, the lack of commonplaces in the city has forced the creation of new spaces, but people need and demand a different kind of public space made of relations and activities.

It is the case of Barcelona with the realization of the Superilles, and, as stated by the authors, these projects offer a new urban model that favors pedestrians rather than cars.

This paper aims to analyze the experience in these spaces, focusing on Carrer del Comte Borrell, the road along which the RCR Arquitectes library and the Leku Studio's Superilla merge into an urban continuum. The void, where the citizen is encouraged to participate and interact, becomes an active space.

Starting from these international strategies, we tried to demonstrate if this approach can be adopted for a listed building and its outdoor spaces; the results show all the potential and critical issues of this strategy.

Keywords

Superilles, superblocks, urban space, architecture, void

1. Public space as a space for relations

Christian Norberg-Schulz (1979), referring to H. P. L'Orange's description of Rome, speaks of the street as an 'urban interior'. For him, the street does not divide but unites. In this case, the building projects part of its activities outside. Today and in contemporary architecture, the street as commonplace returns even more prominent than in the past. This condition plays an increasingly important role in defining spaces where the limit is ambiguous or less marked compared to the past architecture. The fronts are not designed as limits but as permeable and open systems.

Consequently, even the public space is presented differently, as the Colombian architect Giancarlo Mazzanti (2013) states: "…we must learn to plan activities or events that encourage participatory forms of community use. It is not enough to design benches, paving and the other elements that make up public space. We have to be able to arrange and plan such activities…" (p. 37).

The Modern Movement architects, involved in the revolution of the nineteenth-century space, developed a detached relationship with the context. In Mies, the landscape becomes a large canvas as in the Mountain House in Merano of 1934, while for Le Corbusier, the landscape becomes an opportunity to carve the walls as in Villa Le Lac of 1923-24. In Le Corbusier's work, this approach is even more radical in the Plan Voisin, where he tried to "destroy" life on the ground to move people to the upper floors (Sennett, 2019, p. 117). In the Modern Movement, the street is anachronistic (Pérez de Arce, 2018) and is perceived as an essential element of the '800 plans, such as for Haussmann in Paris or Cerdà in Barcelona. The following theories by Team X sanction a return to the street or the void as a commonplace. In Amsterdam, Aldo van Eyck created hundreds of playgrounds in 1946. In these small but fundamental references, we can find several contacts with current urban projects, recalling the famous words of Jane

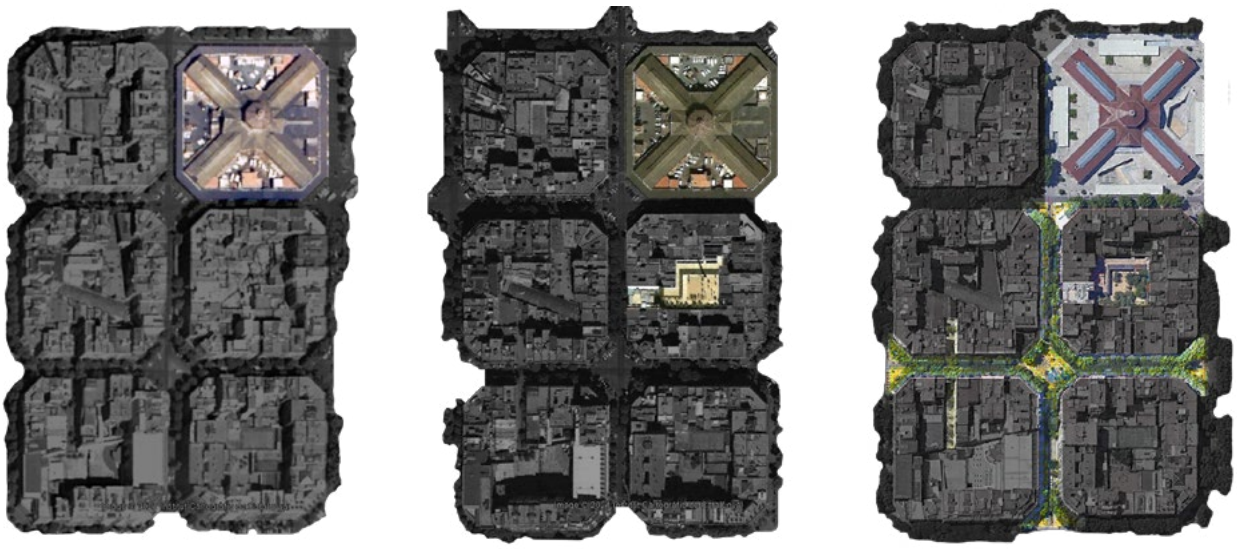

Fig 1. Sant Antoni district development in 2004, 2009, and 2021 (Image: Marco Russo)

Jacobs, who hopes for a more dense, unpredictable and diversified urban system.
Today, we try to recover this relationship with the outside by rethinking not only the public space itself but, above all, the furnishings that can become an opportunity for the original use of the commonplace. The Superblocks program in Barcelona, the first stage of an ongoing transformation process, represents an innovative solutions to rethink urban places. The phrase “grand plans could thus be anticipated by an ephemeral project” (Pérez de Arce, 2018, p. 173) perfectly summarizes the original work carried out in the last five years in Barcelona and open the way to an original and new model of public space. An environment where barriers leave space for a more dynamic system, an image emerged from the analysis of the Sant Antoni Superilla by Leku Studio and the civic library of the Spanish office RCR Arquitectes, one of the poles involved in this urban vision.
Starting from these international strategies, we tried to demonstrate if this approach can be adopted for a listed building and its outdoor spaces; the case study is focused on an urban void in Aversa, a city in Campania where citizens and students will use this new space.

2. The city as a stage for life. RCR Arquitectes

In contemporary architecture, the ground floor opens to the city differently, remanding words as porosity or ambiguity. The contemporary building generates an active dialogue between the construction and its context, such as demonstrating the production of the Spanish studio RCR Arquitectes. As stated by the three architects, their work area is the “between” (Curtis, 2016b, p. 10); a personal interpretation of the “relationship between public and private” (Ibid.).
In Barcelona, in one of the blocks designed by Cerdà in the Sant Antoni district, they completed the Joan Oliver Library in 2007. The building is part of a residential block and its proximity to the historic market makes it a catalyst for significant urban flows throughout the day.
What is striking about the project is the large archway from which we enter the building, leading to an internal playground, the Cándida Pérez Gardens, corresponding to the center of the block. Aranda, Pigem & Vilalta (2016) describe this space as an extension of the internal reading rooms.
In the articulated volumes of the Spanish group, the void acts as a link between the outdoor activities and the specific functions in the building, revealing the genesis of a space ‘crumpled’ on itself. The void, derived from Japanese architecture and Jorge Oteiza’s cajas vacías (Curtis, 2012), is the recurring element of the office, as can be noticed even more clearly in Ripoll, where their building serves to frame the village. In 2012, by reusing the site of the old “La Lira” theater, they created a new urban space for a

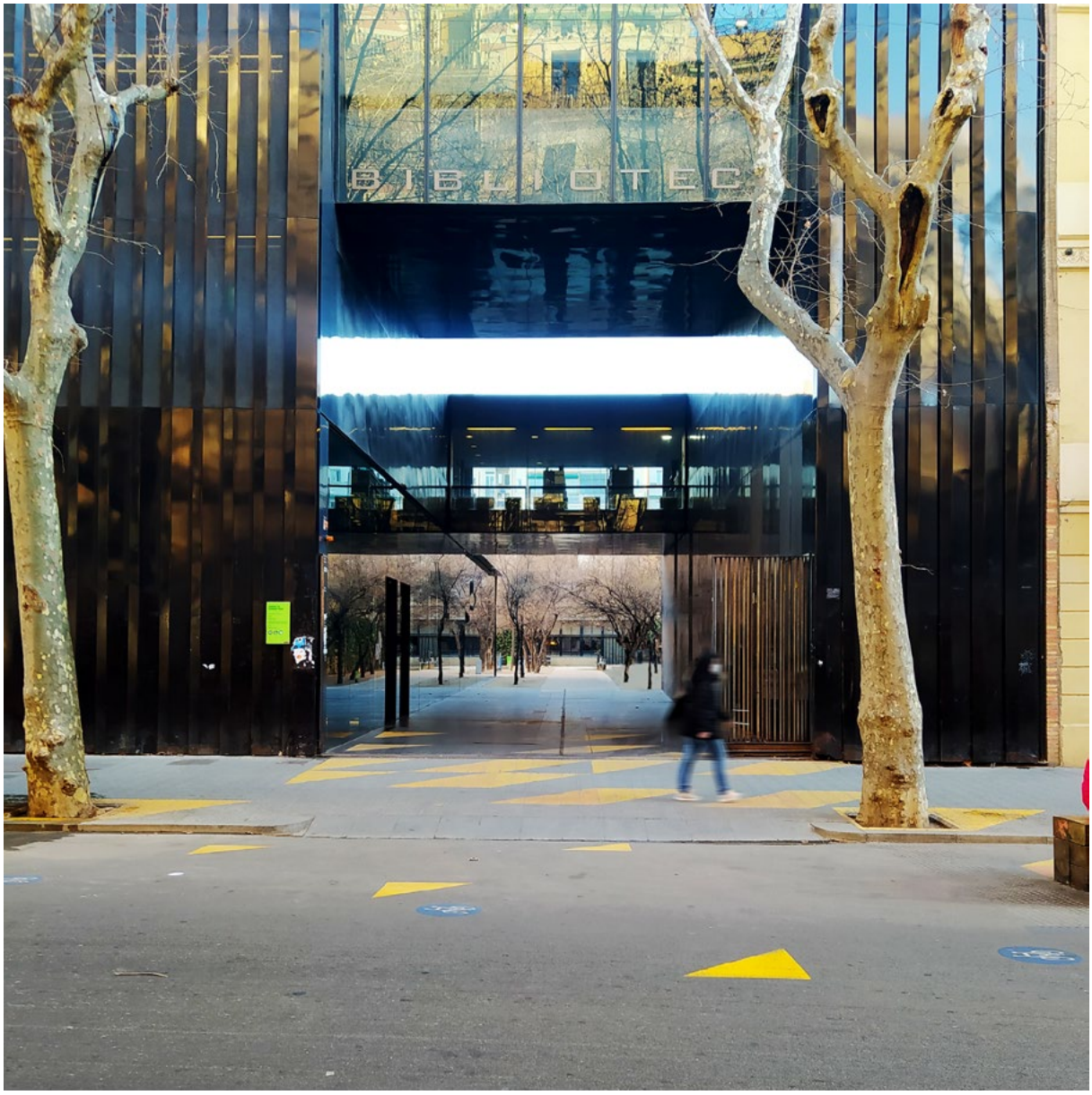

Fig 2. RCR Arquitectes, Joan Oliver Library and Cándida Pérez Gardens, 2002-2007 (Photo: Marco Russo, 2022)

small Catalan municipality offering an original meeting point for debates and festivities. Thanks to a new steel bridge, the river's proximity allows for new urban connections where before, there was a building.

3. Public space kit. Leku Studio

The Programa Superilles is a plan launched by the Barcelona city council in 2016 to stem the problem of pollution from car traffic. This ambitious vision aims to limit the transit of cars in specific zones and allocate these new public spaces to the community. The theoretical basis is a direct consequence of Tactical Urbanism, identifying open and iterative processes such as "short-term, low-cost and scalable interventions and policies" (Lydon & Garcia 2015, p. 2).
The first interventions present the characteristics of temporary installations, while the architecture

competitions in progress propose a permanent modification of the soil. In both cases, the space is dominated by architectural elements that favor play, intended as a catalyst for outdoor life.
Operating in areas of the city where there are several contemporary architectures, this new urban strategy interact with the porous spaces of new buildings, generating a continuous urban environment and reducing the public and private difference.
In 2019 and inside the Superilles Program, a flexible, modular, and adaptive public space was created next to the RCR Arquitectes library. The young Catalan architects Jokin Santiago Elorriaga and Marta Sola Páramo (Leku Studio) designed the new urban solution based on the total modification of the existing flows. The road, having lost the value of a mere car crossing, is remodeled thanks to original modular furnishings. The project is an urban experiment because the initial configuration can change through a 'Kit of special urban elements' (Elorriaga, 2019). A bench, a flowerbed, and a tall planter pot are the modular furnishings that, arranged on a grid, articulate the new public space in the Sant Antoni district. Approximately 16.533 square meters, the paving is animated by a triangular grid made evident by yellow paint; even if the design seems random, the triangular shapes are grouped around the pre-existing elements and draw a new urban scheme. This renewed surface allows several possibilities, and citizens can interact with it thanks to games scattered throughout the grid, such as the hopscotch.
A similar process of urban transformation, based on play and interaction, is re-proposed as part of the strategic plan Barcelona dona molt de joc (Aguirre Such, 2021), where they re-articulate a school courtyard open to the city in the Sant Marti neighborhood. The result is a playground where street furniture, paving, and equipment are seamlessly resolved. In Pamplona, in 2020, the new urban project comprises stone elements, but the goal of reducing car use remains unchanged. The strategy is based on three main actions: connectivity, rehabilitating the public space, and re-naturalization (Elorriaga, 2021).

4. Guidelines for the contemporary (open) city. Potential and critical issues

The projects just described can be considered essential elements of the open city, a place where citizens are involved in the public space through the senses or the game, unlike what happens in the smart city where they remain on its margins (Galofaro, 2018). Urban space is no longer the place of passage or the outside of the building but an extension of it, reconstituting that tension erased in the 'smart city' (Ibid.) between architecture and use by citizens.
Fernando Rodríguez (2016, p. 13) describes the direction of Spanish architecture in a recent article, where he highlights "an approach to the construction of public space as a space for relations, as a system of lines, supports, scenes, and artifices". A vision confirmed by several offices, such as Ecosistema Urbano (2014) or Andrés Jaque (Espinosa, 2020), that worked for many years on dynamic urban plans or ephemeral urban installations.
Juhani Pallasmaa (2012) talks about a renewed link between architecture and public space: "architecture is constituted in its spatial, material and experiential encounter" (p. 323). For Pallasmaa, this attitude derived from John Dewey's *Art as Experience* of 1934, an essential text that finds several applications in contemporary architecture where shape and use are strictly connected.
About the 'open city' and the way of designing porous systems or incomplete forms, Richard Sennett (2019) affirms that we need to think of "simpler and at the same time more flexible buildings" (p. 122), thanks to which it is possible to untie the space with a specific purpose.
Replication of these concepts is possible, and we can also import them into another context as a listed building without modifying it. Reusing an empty site in Aversa (4.000 sqm) allows us to design a disused place, transforming it into a space open to the city and students.
Starting from the general plan, one of the main problems in rearticulating the neighborhood where parking relocation. The urban fabric is quite dense even though we are in a suburban context, and the parking spaces could be moved only far from the houses in contrast to the Spanish examples, where there are several underground parking and a well-structured public transport network. In another context, such as in Scandinavian countries, these facilities are located in standalone structures masked between residential blocks; in most cases, the roof becomes a playground recalling Le Corbusier's ideas to transport life on top of the buildings. Copenhagen presents several projects related to this topic; the new Nordhavn and Ørestad neighborhoods represent a new urban model for the city.
The road section is another critical element since in Campania we have reduced dimensions compared

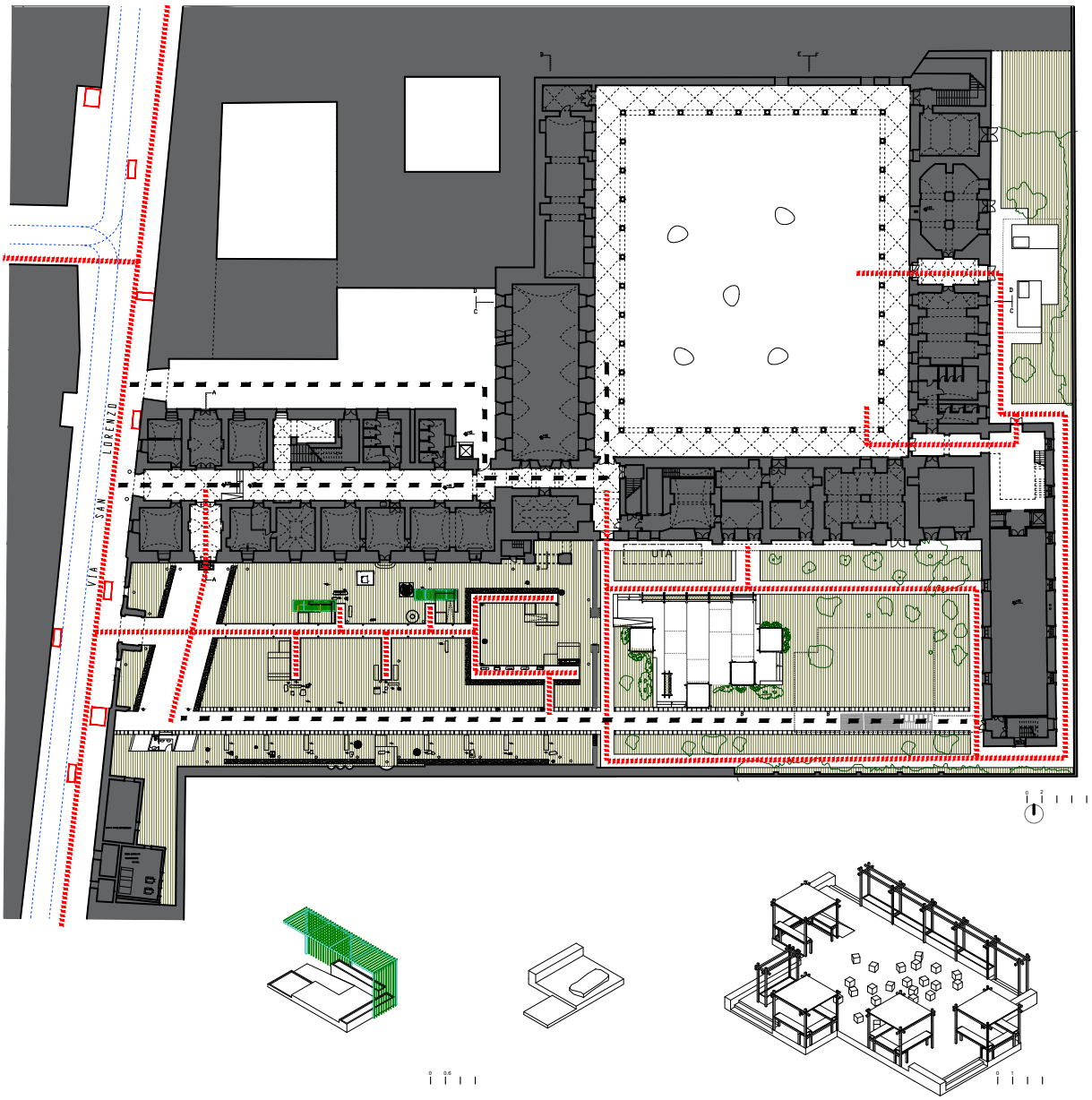

Fig 3. Superblock San Lorenzo, 2022 (Masterplan and '800 garden: Efisio Pitzalis, Marco Russo)

The road section is another critical element since in Campania we have reduced dimensions compared to the typical twenty meters of Barcelona. Modifying the roadway in favor of exclusively pedestrian and bicycle mobility can only be proposed for specific streets, making it impossible to fully apply the 'superblock model' for the selected case study.

The Spanish strategy is not limited to the grouping of several blocks. We are faced with a new idea of urban space, a place in which preconfigured ways no longer condition the citizens' flows. In these projects, benches or other furnishing elements are rethought and are actively involved in the design.

Whether modular or adapted to the architecture geometry, we can say that these new furnishings support a diversified or even unexpected use of public space. For the historical garden in San Lorenzo, we proposed a series of modular platforms with different sizes and uses. Some elements are dedicated to horticulture, while others are dedicated to the exhibition of archaeological finds.

A similar modular platform is placed in the inner part of the garden; this is a space for events, such as

department meetings, conferences, or even a space for outdoor activities.
In conclusion, we can be said that the 'superblock model' can be transported to other realities because this strategy can be recognized for its ability to have supported the transition from anonymous public spaces to diverse and original places, having projected the city toward an open perspective.

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05 Circular Technological Design for a carbon neutral approach

How to pursue the Whole Life Carbon vision: a method to assess buildings' Embodied Carbon

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Abstract

The design and construction of CO_2-neutral buildings by 2050 will be possible through many actions and strategies, including new metrics and indicators that would contribute to the accounting process for greenhouse gas emissions over the building's life cycle. Among the range of helpful indicators is Embodied Carbon (EC). Standards and references describe EC characteristics and possible uses both in the design stage and in other building life cycle stages, at the same time, they point out a need for methods of building CO_2-equivalent emissions calculation.
The paper deals with research titled "decarbonisation tools" aimed at providing common definitions and at developing an EC accounting method. The main phases of the investigation work are reported. Further, the paper describes some future developments and outlooks for making EC an indicator understandable to several stakeholders of the construction sector as well as user-friendly from the early stage of the design process.

Keywords

Whole Life Carbon vision, Embodied Carbon, Carbon emissions, Global Warming Potential, Buildings' materials

1. Introduction

Global warming, due to the anthropogenic Green House Gas emissions (GHGs), has caused a mutation of the environment with huge consequences on ecosystems. Extreme natural phenomena such as heatwaves, flooding, rising sea level and more frequent storms have become commonplace and many of them are irreversible (IPCC, 2021).
For this reason - to avoid long-lasting effects - the global temperature rise must be limited to 1.5 degrees Celsius (°C) above pre-industrial levels (IPCC, 2018). Albeit world governments have signed an agreement (UNFCCC, 2016) and a climate pact (UNFCCC, 2021) to not exceed this threshold and to reduce GHGs, studies on climate trends show an increase of 2.4 °C by the end of the century (WMO, 2021; Climate Council, 2021).
In this context, the Building and Construction (B&C) sector plays a key role in GHGs. It is responsible for 38% of global carbon dioxide (CO_2) emissions, 10% of which result from manufacturing building materials and the other 28% is due to building's operational stage (UNEP, 2020).
From the Paris Agreement's actions (UNFCCC, 2016), several strategic initiatives have been launched to support the sustainable transformation of the built environment. With regards to the B&C sector, it is worth mentioning the Global Alliance for Buildings and Construction that advocates mitigation and adaptation strategies for the buildings as well as provide every year reports on progress toward a zero-emission, efficient, and resilient sector (UNEP, 2021).
Furthermore, in the framework of the Paris Agreement, it should be remarked on the encouragement participatory approach by several stakeholders, who acting in the B&C sector. The Built Environment Declares - signed by international architectural studios - can be considered one of the most interesting. It sets up strategic actions to be taken in the next years. Some other local proposals deserve to be

highlighted, such as the London Energy Transformation Initiative (LETI, 2020) and the Built for the environment report (RIBA, 2021). Both provide actions for a transition to a fair and sustainable built environment.
The common denominator of the several examples described is the necessity to have net-zero CO_2 emissions by 2050. In order to achieve such an ambitious goal, each of the mentioned references highlights the importance of the design stage as a key process to assessing the anthropogenic and biogenic impacts related to materials selection; to get at a Whole Life Carbon (WLC) vision.
WLC can be taken as a program in which operational impact, related to the building use, as well as embodied impact, from materials and construction stages, must be net-zero.
The importance given to embodied impact is twofold. On the one hand, there is a gradual decrease of CO_2 emissions due to lower energy needs for thermal and electrical uses, with a consequent redefinition of the ratio between operational and embodied impacts (Benjamin, 2017). On the other hand, in order to achieve high-performance buildings, the use stage requires more materials, components and services, which means that the embodied impact is higher than it used to be, as shown by some studies (IEA, 2019 and 2020; Zimmermann, 2020).

2. Embodied Carbon: reference standards, definition, and ongoing development

The assessment of anthropogenic and biogenic impacts of materials can be performed with Embodied Carbon (EC) (Pomponi, 2018). EC is an indicator able to assess emissions and removals of carbon dioxide equivalent (CO_2eq) by building materials and its extension by the whole building (Marsh, 2018). The CO_2eq is a unit of measurement that expresses the impact on global warming by a given quantity of GHGs (CO_2, methane, nitrous oxide, etc.) compared to an equivalent amount of CO_2; the conversion factors have been described by the Intergovernmental Panel on Climate Change (IPCC, 2013).
The determination of potential material's CO_2eq emissions can be traced back to the following references: the methodological framework of the Life Cycle Assessment study (UNI EN ISO 14040-14044:2021); the regulation on Environmental Product Declarations (EPD) (UNI EN ISO 14025:2010; UNI EN 15804:2021); the calculation method provided for assessing the environmental performance of buildings (UNI EN 15978:2011).
Each of the mentioned references does not exactly define the EC indicator, although the methodological approach proposed allows the calculation of Global Warming Potential (GWP), which is a key component of the EC. GWP is - in fact - an impact category able to measure the CO_2eq by GHGs, generally calculated on a time reference established over 100 years (IPCC, 2013).
A more detailed definition of EC has been described by the International Energy Agency, within the technical report: Evaluation of Embodied Energy and CO_2eq for Building Constructions - Annex 57.
Concerning the CO_2eq emitted and removed by building materials, it has provided the following definition: EC is a widely-used term that usually describes a greenhouse gases accounting method over one or more life cycle stages of a product, other than the ones related to the use phase of the building (IEA, 2016).
Although it proposes this general establishment, it also specifies that there are still no clear and commonly accepted definitions or a calculation methodology. Furthermore, the report highlights that no method has been identified to account for CO_2 removals from mitigation strategies acting on the building's design.

3. The project "decarbonization tools"

Within the international framework – before mentioned – still featured by some uncertainties, Green Building Council Italia has taken part in a European-scale project called #BuildingLife (WGBC, 2021) and it has set up some working teams. The Department of Architecture and Design (DAD) of the Politecnico di Torino has been selected to lead one of them with the main objective to develop a framework for EC accounting in the B&C sector.
Particularly, the *Decarbonization tools* project is aimed at identifying: references, methods, and potential tools to assess the EC in the design stage. The research has been carried out through phases, hereafter described.
First, in agreement with the references, a specific EC definition has been defined. It has been established that EC is an indicator able to assess the amount of CO_2eq that can be emitted, stored, removed, offset, and uptake by a certain good (product or whole building) in one or more life cycle

Tab 1. Embodied Carbon accounting

Stage	Sub-stage	Functional unit (f.u.)	Method
Production and Construction (A)	Manufacturing (A1-A3)	CO_2eq/kg CO_2eq/m^3 CO_2eq/m^2	EC associated with A1-A3 is generally available as generic data from databases or as specific data such as EPD and Carbon Footprint The EC of a material is obtained by multiplying the unit value of EC by the total quantity of material required in the design.
	Transport to the building site (A4)	CO_2eq/tkm	Distance and total amount transported in tonnes are multiplied by carbon emissions associated with transport mode (EN 16258:2013)
	Construction (A5)	CO_2eq/m^3 CO_2eq/kWh CO_2eq/MJ	The amount of diesel consumed by equipment is multiplied by its specific emission factors (e.g. SCAB, 2022) while the amount of electric energy is multiplied by other specific emission factors (e.g. ISPRA, 2021)
Use (B)	Use (B1)	/	Excluded as considered negligible
	Maintenance (B2)	/	Excluded unless specific information is given by the manufacturer
	Repair (B3)	CO_2eq/kg CO_2eq/m^3 CO_2eq/m^2	Can be assumed as 10% of the emissions from the materials used in the building throughout its life cycle
	Replacement (B4)	CO_2eq/kg CO_2eq/m^3 CO_2eq/m^2	Specific information should be provided by the manufacturer. The emissions of the replaced material are calculated by stages A1-A4
	Refurbishment (B5)	/	Excluded as out of expected life cycle
End of Life	Deconstruction (C1)	CO_2eq/kWh CO_2eq/MJ	Same method as *Construction (A5)*
	Transport to waste processing (C2)	CO_2eq/tkm	Same method as *Transport to the building site (A4)*
	Waste processing (C3)	CO_2eq/kWh CO_2eq/MJ	The energy needs by equipment, for disassembling and processing waste, is multiplied by its specific emission factor (e.g. ISPRA, 2021)
	Disposal (C4)	CO_2eq/kg	Emissions are estimated by adopting the environmental impact factor provided by US Environmental Protection Agency (e.g. EPA, 2020)

stages. It means that the accounting identifies a given amount of GHGs and assesses its contribution as CO_2eq over the building life cycle.

The second phase has devoted to setting out the building stages to be included in the EC account and how to perform it stage by stage. Such stage has been developed according to a reference standard, the EN 15978:2011. Particularly the EC can be associated with the following stages: Production and Construction (A), Use (B), and End-of-Life (C). As expected in the EN standard, the operational impact has not been included.

Moreover, in order to encompass the potential benefits due to mitigation strategies, also the benefits and loads stage (D) has been included. Not overlooking that the D stage needs to be investigated independently from other stages (A to C).

The third phase has identified the methodology for EC accounting in each building life cycle stage. Table 1 summarises the developed method. The first and second columns show the building's stages and sub-stages analysed. The third column defines the unit(s) – or functional unit(s) – that could be considered in the calculation. Finally, the fourth column displays the basic information necessary for EC accounting. References and standards for the calculation are also mentioned.

The fourth phase has focused on the normalisation process. It has summed up the single EC values accounted for each sub-stage. The functional unit (f.u.) may vary from building to building. For this reason, the working team has investigated some examples (e.g the Swiss Minergie® Certification) in which the embodied accounting has normalised. Minergie® splits up the EC into two independent calculations. The former accounts for the total $kgCO_2eq$ (or tons) per square meter of heated (cooled) spaces. The latter accounts for the total $kgCO_2eq$ (or tons) per square meter of un-heated (un-cooled) spaces.

Finally, the EC has to be referred to an expected building life (year) to calculate a result estimated in $kgCO_2eq*m^2*year$.
The number of years - obviously - can be different, e.g., a temporary building has a short life while a permanent building has a longer lifetime (Grant, 2014; DGNB, 2020). The average value can be set at 50 years, since it is the one more frequently considered in the references.

4. Discussion and Conclusion

As described, the *Decarbonization tools* research has proposed an EC accounting method aimed at integrating the IEA report, the EN standards as well as other mentioned references.
Nevertheless, there are some specific issues that future research should cover. While the method is now developed, it will be necessary to define which data should be used for the calculation, making a distinction between data sources for designing and for building construction, materials replacement, etc. For instance, the early design stage may require generic data, while the other stages, can be analyzed through EPDs or Carbon Footprint studies.
Another important issue that should be studied is CO_2 compensation. At least two scenarios deserve to be considered: the uptake by concrete and cement products and the offsetting by trees and vegetation. Both may change - even significantly - the building's carbon balance.
Further work is also needed, such as a correlation study between operational and embodied impacts.
Finally, method validation is required. It would be useful for an investigation of several cases of studies. If the method was applied to a selection of buildings, it would be possible introducing threshold values to set out an EC rating system.

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C2C as a reference framework for circular buildings. Implementation on an existing settlement in Rome

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Abstract

The circularity paradigm represents an indispensable instrument to tackle resource scarcity and climate change, promoting closed loop use of materials and, consequently, decarbonization. Implementing the circular approach in the built environment entails adopting a holistic design approach, such as the Cradle to Cradle (C2C). The most interesting challenge seems to derive from applying C2C strategies to the existing, integrating the Nearly Zero Energy Building standard with the Nearly Zero Impact of Materials Used Over the Whole Life Cycle approach, focusing on circular design solutions for the upgrade of the existing building stock. Statement is that the buildings are meant as a resource themselves, though not designed for disassembly and recovery of components and materials. The paper illustrates the implementation of circular design and of an urban mining approach in the regeneration of existing settlements, made with traditional techniques, highlighting its critical issues.

Keywords

Cradle to Cradle, urban mining, circular building, reuse, urban regeneration

1. Introduction: the evolution of the C2C paradigm in the building sector

Since 1972, global use of materials has nearly quadrupled, while waste levels are raising, with over 90% of all materials extracted and used currently wasted, representing a massive Circularity Gap (Circle Economy, 2022), mainly in construction sector. Therefore, the circularity paradigm represents an indispensable instrument to tackle resource scarcity and climate change, promoting closed loop use of materials and, consequently, decarbonization. Implementing circular approach in built environment, in response to the EU objectives (*A new Circular Economy Action Plan*, 2020), means creating closed loops of materials, but entails adopting a holistic design approach, such as the Cradle-to-Cradle (C2C) one by McDonough and Braungart (2002). The first attempts to provide directions to turn C2C into practice for the building scale were contained in the Hannover Principles (1992), in the Almere and Floriade Venlo Principles, but were not fully effective because not measurable (Van de Westerlo et al., 2012). The first real transposition of these principles into criteria for the built environment [tab. I] in 2010 also provided the definition of a C2C building as one that "contains defined elements that add value and celebrate innovation and enjoyment by: measurably enhancing the quality of materials, biodiversity, air, and water; using current solar income; being deconstructable and recyclable, and performing diverse practical and life-enhancing functions for its stakeholders" (Mulhall & Braungart, 2010, p. 7). Since then, there has been a relevant evolution towards a more articulated reference framework for circular buildings, specifying more detailed design and construction criteria (Jurkait & Stiglmair, 2019) and thanks to the integration of new tools such as Material Passports (Mulhall et al., 2017; Altamura, 2019). The principles are now supported by the monitoring tool *Building Circularity Passpor*t, which serves both as a planning tool and as documentation after construction (providing detailed information on disassemblable materials and their chemical composition) enabling the building to be recyclable and to demonstrate this quantitatively in retrospect, which is increasingly important, not least because of tightening ESG regulations and EU taxonomy (ECESP, 2021).

Tab I. C2C criteria for the built environment. Source: Jurkait & Stiglmair, 2019

C2C principles	Criteria and desired results
	1. Define materials and their intended cycles
	1.1 Materials and products can safely return in a biological or technological cycle, without quality loss
	1.2 Cradle to Cradle Certified™ products and materials are applied in the building
	1.3 Material contents come from renewable or recycled materials
	1.4 The design and construction team assessed applied products and materials in the building based on their intended use and impact for its users and the surrounding
Waste equals food	**2. Integrate biomass production**
	2.1 More biomass, topsoil and clean water is generated by the building than before the development of the site.
	3. Enhance air and climate quality
	3.1 The outdoor air quality is improved by the building so the air becomes healthier than before development, and climate change gases are used to produce biomass
	3.2 The indoor air quality is healthy and comfortable for occupants and users.
	4. Enhance water quality
	4.1 The quality of water is improved by the building and healthier than before it entered the building.
	5. Integrate renewable energy
	5.1 More renewable energy is generated by the building and its site than the building consumes
Use of renewable energy	5.2 Energy-efficiency is used to introduce renewable energy rather than reducing fossil fuels
	5.3 Exergy is used as a way to guide energy effectiveness
	5.4 Innovative techniques to produce renewable energy are integrated
	5.5 A monitoring system that measures the energy consumption and production is used.
	6. Biodiversity
Celebrate diversity	6.1 Biodiversity is increased by the building.
	7. Conceptual diversity
	7.1 Innovative elements of the building are beneficial for the wellbeing of occupants and the environment.
	8. Organize reverse logistics
	8.1 Supply and discharge of defined materials and products is organised.
	9. Design for (dis)assembly
	9.1 A plan to deconstruct building elements, products or materials without demolition waste is made
	9.2 The building can be adapted without demolition waste.
Further criteria	**10. Define intended use periods**
	10.1 Intended use periods of the building, products and materials are defined.
	11. Enhance environmental qualities
	11.1 The building improves the quality of the building surrounding
	11.2 The quality of the top soil is improved by the building (including green roofs).

A group of buildings implementing C2C principles and relative tools have been developed in the last years [fig. 1], with a growing complexity of circular strategies: the Venlo City Hall (NL), the Archipel building in Paris (FR), the Moringa in Hamburg (DE) and the ZIN building in Brussels (BE). For the Venlo City Hall (2016), one of the first attempts to systematically apply the C2C design principles at the building scale, Circularity Passports for all building products were developed and continuous material cycles ensured with leasing and take-back programmes by manufacturers. More recently, in Hamburg HafenCity, kadawittfeldarchitektur designed Germany's first C2C high-rise residential building, the Moringa, with a modular structure in its timber façade allowing easy disassembly and recycle, more than 50% of the materials chosen with reuse in mind, prioritizing C2C certified materials. In 2018, a brand-new application of the C2C principles has been launched in the renovation of two of the four towers of the World Trade Centre in Brussels in the ZIN project, currently under construction. A material inventory allowed to use different strategies such as material reuse, recycle and upcycle and their certification in collaboration with different actors from the industry, ensuring that 95% of the existing is being kept, reused or recycled, while 97% of the new materials are C2C-certified or equivalent.

In fact, the most interesting challenge today derives from the application of C2C strategies to existing buildings, addressing the problem of the quality of existing materials and of the lack of certification protocols suitable for reuse. The research illustrated in this paper intends to offer a contribution on this goal, and on the related critical issues, through the implementation of circular design and of an urban mining approach in the regeneration of existing settlements.

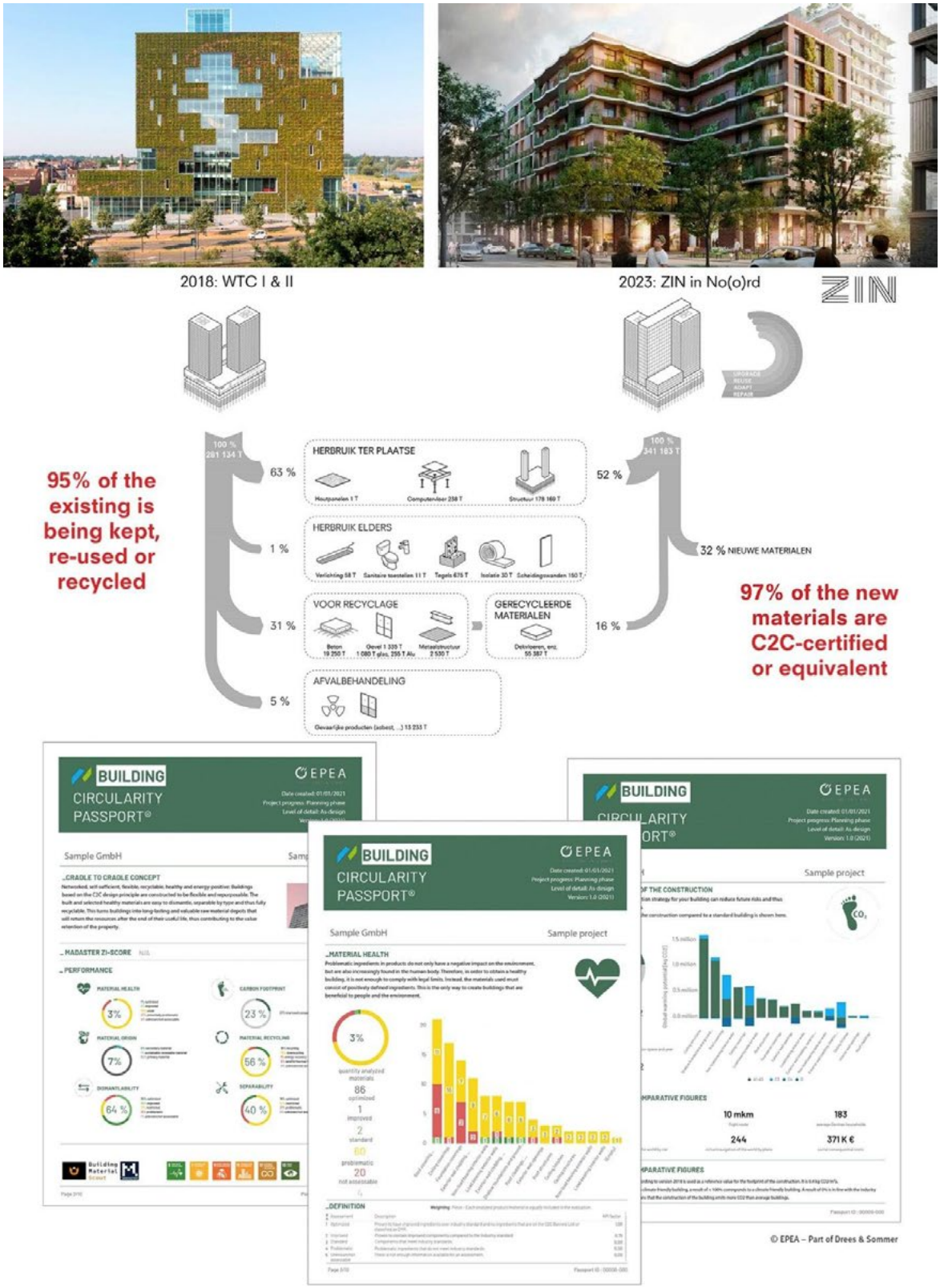

Fig 1. Above, left: Venlo City Hall, one of the first C2C buildings, using also Material Passports for all products (Kraaijvanger Architects, 2016, source: http://www.c2c-centre.com/project/venlo-city-hall); above, right: Moringa Buildings in Hamburg (kadawittfeldarchitektur, 2021-2024); centre: Brussels North area ZIN Project (Befimmo SA, 2019, credit: Befimmo SA); bottom: Building Circularity Passport® (EPEA – Part of Drees & Sommer, 2021).

2. Research approach and focus

The Research Group (RG) is engaged in a line of experimental activities aimed at integrating the *Nearly Zero Energy Building* standard with the *Nearly Zero Impact of Materials Used Over the Whole Life Cycle* approach, focusing on C2C design solutions for the upgrade of the existing building stock (Altamura & Baiani, 2019; Baiani & Altamura, 2021). The research focuses on urban regeneration strategies combined with circular design solutions by promoting *reuse* at different scales (district, buildings, components, resource flows). The aim is to fill a gap on reuse, since research to date has largely focused on recycling construction and demolition waste with little attention on the reuse of components and products (Adams et al., 2017). Furthermore, the developed design methodology allows to adopt an urban mining approach, valorising materials that are already there, in the city, in the built environment but also waste stuck in other value chains. This allows to avoid lengthy supply chains, which in turns helps increasing resilience: urban mining enables to maintain as much value as possible from the existing materials, for as long as possible (Blok, 2021).
In this sense, the RG looks at the *superuse* design experiences, defined, fostered and implemented in the last 20 years by the pioneering architectural studio 2012 Architecten (today, Superuse Studios) in the Netherlands. These regard the valorisation of locally available industrial waste through architectural design, as complementary to the reuse of construction and demolition materials.
Moreover, the design experiments described below implement C2C principles on existing buildings through design for reversibility technological solutions, to ensure the possibility of recovering all the materials used today in subsequent cycles in the long term.

3. A design experimentation in the regeneration of a social housing settlement in Rome: objectives, methodology and phases of the research

The design experimentation focuses on social housing in Rome (Torrevecchia District), aiming at the overall environmental, social and economic sustainable regeneration. Statement is that the buildings are meant as a resource themselves, though not designed for disassembly and recovery of components and materials. The design process follows these steps.
Phase 1 analyzed material (materials, waste, water, green) and immaterial (bioclimatic, energy) resources that link biophysical and morphological components and interrelate with land uses. The material resources, from deconstruction, are enhanced by reuse in the building, while those produced during use phase (solid waste, clippings and prunings) are re-circulated for reactivating local economy.
Phase 2 focused on the mapping of potential material sources, through the assessment of existing building components and materials, estimation of their volume and weight and calculation of the embodied CO_2. The reusable components that can be sent to remanufacturing or to recycling and reuse in situ are integrated with sources of disassembled materials/components/waste products from buildings or industries in the local area (25 km). The Harvest Map of sources from other supply chains (surpluses, defective products, processing offcuts) is also integrated in the process of selection.
Phase 3 led to the design of a new masterplan for outdoor public, semi-public and private spaces, integrated with the ground floor of the buildings, both in spatial and in functional terms, introducing green to improve comfort conditions and increase surfaces permeability to optimize water cycle and adapt to climate change [fig. 2]. Reducing resources demand, by efficient and circular components and processes, makes it possible to reduce and close the cycles of material and immaterial resources in a synergic way, integrating renewable and zero-km, in a correct balance.
Phase 4 addressed buildings redesign, focusing on flexibility in the use of spaces, in order to achieve a functional mix within the flats through light, transformable, disassemblable components to build a space “tailored to the user” [fig. 3]. In parallel with the definition of the design solutions, the quantification of reuse components allows to assess circular technical options and the selection of new, renewable, certified materials reduce environmental impacts and intervention costs, also ensuring reusability and recyclability.
The integration of green is fundamental to define solutions in which technical system assumes natural performance as a key for microclimatic control, to "naturalizing the artificial".

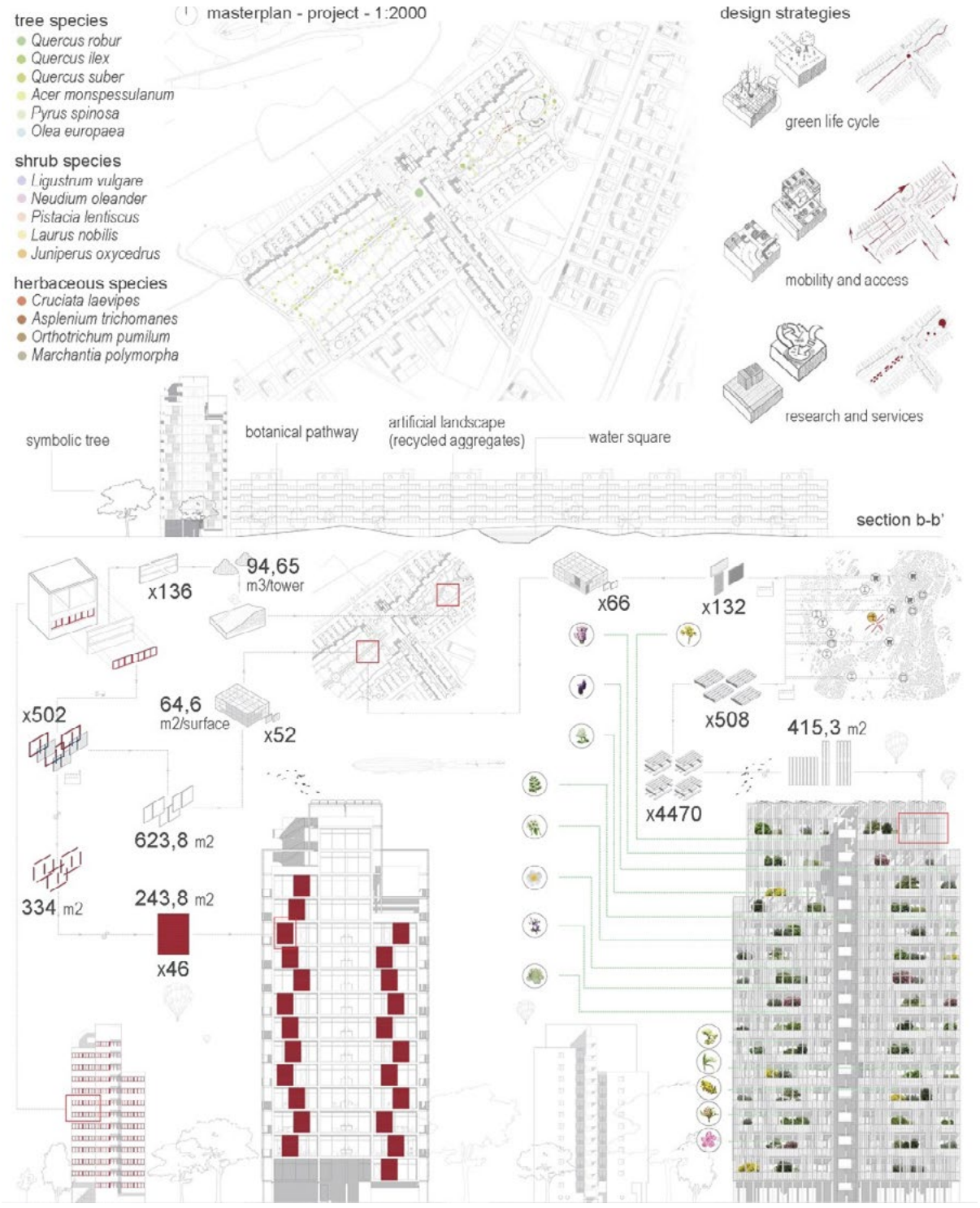

Fig 2. Implementation of the C2C approach combined with urban mining strategies in the regeneration of the Torrevecchia social housing district in Rome: above, new masterplan with related strategies; in the middle, a urban section with a new topography using recycled aggregates; below, the Harvest Map used to identify materials sources for the redesign of the facades, with pass-through loggias added to the existing building that house bioclimatic devices and vegetation on two sides and sliding shading panels on the others (credit: S. Baiani, P. Altamura with V. Ierardi, A. Lanna and G. Rossini, 2020)

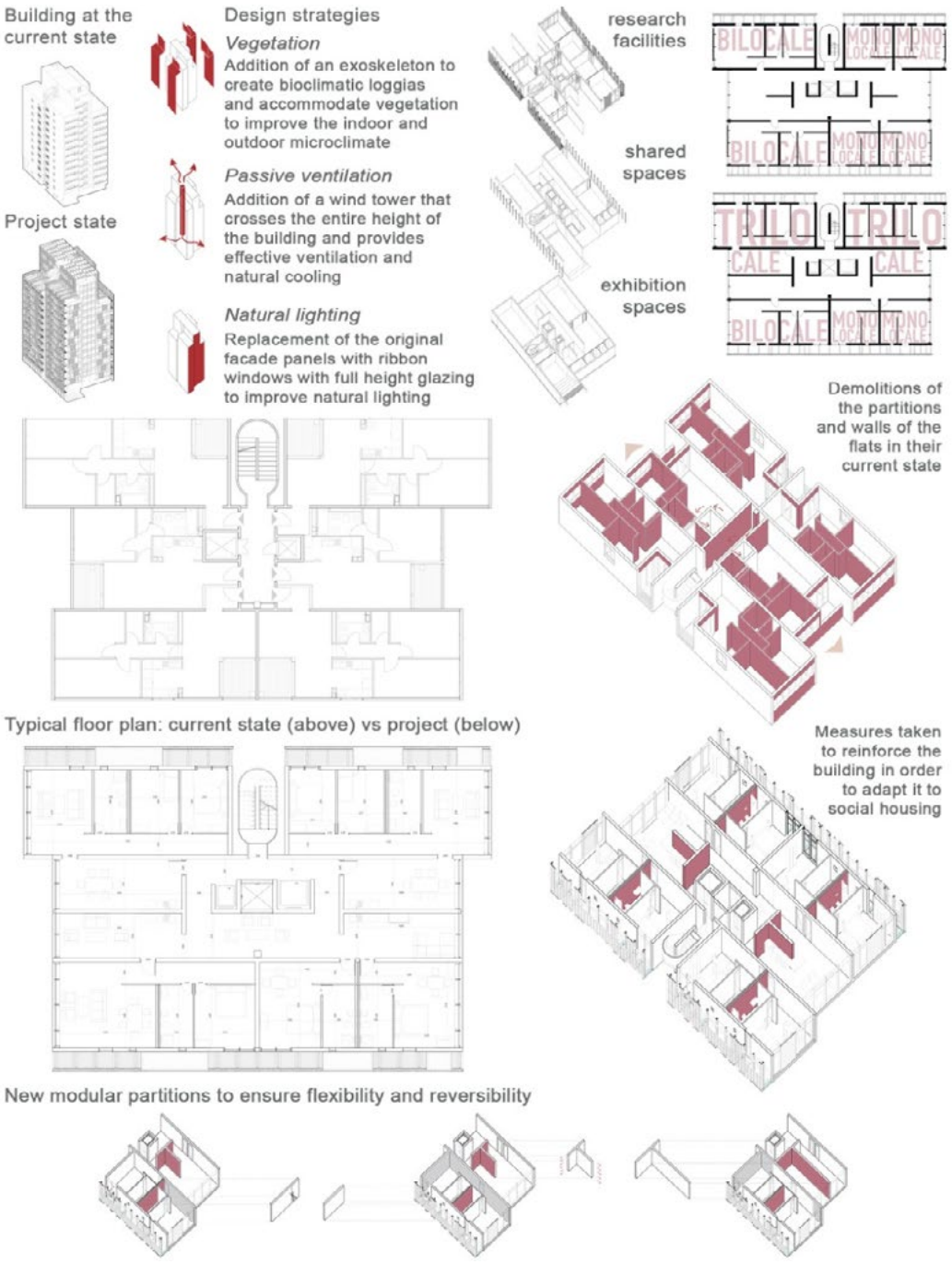

Fig 3. Implementation of circular and reversible design principles in the upgrade of the flats of Torrevecchia, at the different floors of the towers (credit: S. Baiani, P. Altamura with V. Ierardi, A. Lanna and G. Rossini, 2020)

Phase 5 has been oriented towards the assessment of achieved results (transversal to all phases). The evaluation of choices in the redesign phase, through the comparison of environmental, technological and economic costs and benefits, allows the selection of technical options to define multiple scenarios. A key aspect in assessing the level of material resource efficiency achieved is the identification of indicators to measure the effectiveness of the choices made (recycled content, landfill rate of materials removed, share of material recovered on-site, preserved embodied CO_2).

4. Conclusion

The circularity and decarbonization potential which can be unlocked by reusing and regenerating the existing building stock in our cities is huge. This is particularly true for the housing stock, if we think that the largest resource and emissions footprint is for construction and maintenance of residential houses, especially in lower income nations (Circle Economy, 2022). Therefore, it is necessary to prevent the production of waste in the short and long term by rethinking the design and construction process, taking into account the supply chain, so as to: maximize the use of renewable materials, energy and resources coming from reuse and recycling (sustainable inputs); extend the useful life of buildings through eco-design, design for deconstruction and replaceability of components; use sharing platforms for the management of materials and products between different users; adopt "product as a service" approaches; enhance end of life with reuse / regeneration / recycling strategies.
The research experimentation described in the present contribution implements such circular approach based on C2C principles combined with urban mining strategies. Limits are mainly in the scalability of the solutions, that needs to be supported by the investigation of reuse potential on a large stock of buildings. On this topic, the RG is currently working in collaboration with a specialized research team from ENEA (IT).
Furthermore, a specific contribution will focus on the experimentation on traditional Italian construction systems, which do not provide for deconstruction as an end-of-life option, except in specific restoration solutions, on which research is evaluating ways of recovering and reusing materials within "new" components through the transfer of appropriate deconstruction methods and the integration of completely disassembled, integrated and reversible systems.

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Digital-green transition of knowledge buildings

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Abstract

Low energy educational buildings are becoming the standard for new buildings in European and Mediterranean partner countries. Meanwhile, the potential of efficient renovation of existing buildings continues to be a development focus in these countries. Technical solutions are continuously proposed by universities for eco-sustainable building renovation, but there is still a gap between designed models and real-world application. Med-EcoSuRe project is rooted in the key role that Mediterranean universities have to contribute to environmental development and combat climate change. The project brings together researchers and stakeholders to build a common understanding of the eco-sustainable building renovation issues and aims to empower regional knowledge-to-action process, starting by the university's immediate neighbourhood, which is the university building.

Keywords

Sustainable Design, University Building, Energy Audit, Living Lab, Digital-Green Transition

1. The Med-EcoSuRe project

Med-EcoSuRe (Mediterranean University as Catalyst for Eco-Sustainable Renovation) is a project funded by the European Union, under the ENI CBC MED programme 2014-2020 (Med-EcoSuRe, 2022), gathering academic and socio-economic partners from Tunisia, Palestine, Italy and Spain (Fig.1a)
The project is addressing the university buildings in the Mediterranean region facing renovation issues which are inherently challenging when dealing with complex connections between human thermal comfort and environmental preservation, between local level and regional level and between knowledge and action.
In this context, Med-EcoSuRe aims to propose and implement innovative and eco-sustainable energy innovative solutions for Mediterranean university buildings, introducing an active collaborating approach for decision support, among key actors involved, in the framework of a "Living Laboratory (LL)".

2. The Energy audit

An effective and fruitful effort has been made to conduct energy audit at An-Najah National university, Palestine, to estimate Energy consumed, identify the areas of energy wastage and estimate the energy saving potential. The data have been collected and analysed by in-depth analysis of the energy performance, installation of energy meter for each building individually and comparative analysis of

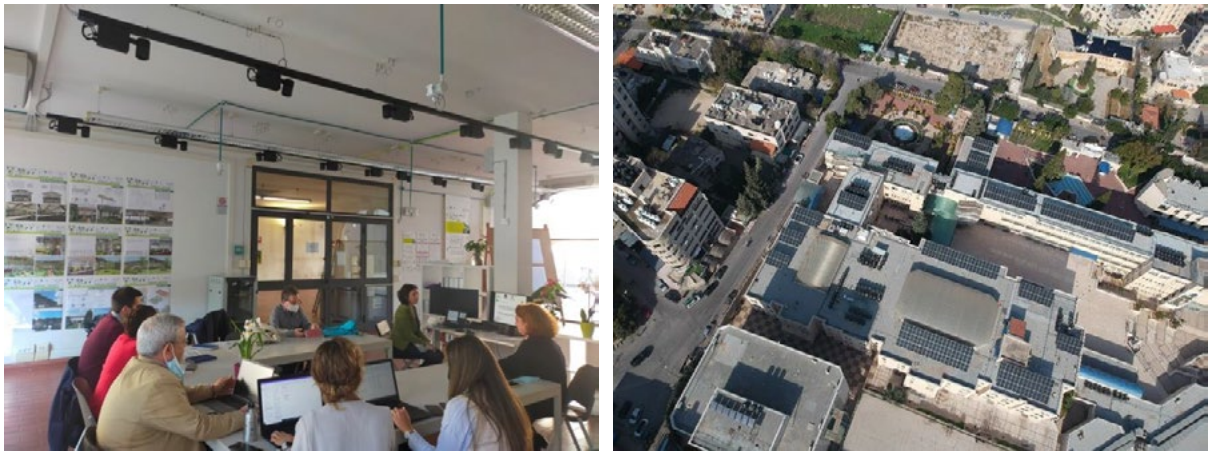

Fig 1. a. Partnership meeting- Pilot building of Santa Verdiana (Florence - Italy); b. On-grid PV system on roof-top in old campus An-Najah National University

energy performance across multiple buildings, which facilitated our work in suggesting cost-effective measures to improve the efficiency of energy use.An estimation of implementation costs and payback periods for each recommended action has been made. Some of recommended measures were implemented for better energy efficiency and reduction of electricity bill, and thus PV power plants have been implemented on roof of old campus (Fig. 1b), art college garage at new campus, solar tree in university area, and currently PV solar system is being implemented on the roof of faculty of Agriculture and Veterinary Medicine. The total capacity of solar systems is 280kW, which expected to save around 90k€ in electricity bills annually and saving around 550 MWh yearly.

3. Med-EcoSuRe software for Energy Audit

The Med-EcoSuRe Project focuses on the rehabilitation of university buildings. The main characteristic of these buildings is that they are public, so they have an administrator who ensures that their energy consumption is controlled. In the rehabilitation of this type of buildings, a refurbishing project begins with an energy audit that allows the consumption of the main equipment to be associated with the thermal loads that must be satisfied (Heating, Cooling, DHW) and Lighting.
These data, together with the geometric and constructive definition of the building, in a rather simplified way, are introduced into the analysis tool that has been prepared, which allows to select the optimal combination of energy saving measures, classified in measures of the envelope, conditioning systems and lighting. It is also possible to consider innovative solutions, such as solar, thermal or photovoltaic, energy systems. The Figure 2.a reproduces a screen of the software, accessible through a WEB server that does not require any type of installation on the user's computer.

4. The tools to certify energy and environmental quality

Different tools for assessing the sustainability of universities (Albis 2017), like Sustainability Tracking, Assessment & Rating System (STARS), the Princeton Review and Green metrics, were analysed and compared whit green building rating systems, like LEED, Living Building Challenge (LBC) and EDGE, in order to extrapolate key performance indicators relating to the energy and environmental quality of building without neglecting that the evaluation should also ensure user satisfaction.
The objective is to develop a simple tool for the selection and measurement of the sustainability of universities buildings, not only to highlight the truly virtuous buildings, but also to identify the strengths and weaknesses of the university building stock in order to implement the most appropriate redevelopment strategies.
These strategies, according to the Renovation Wave Strategy, are intended to improve not only higher energy and resource efficiency of buildings, but also the quality of life for people living in and using university buildings.

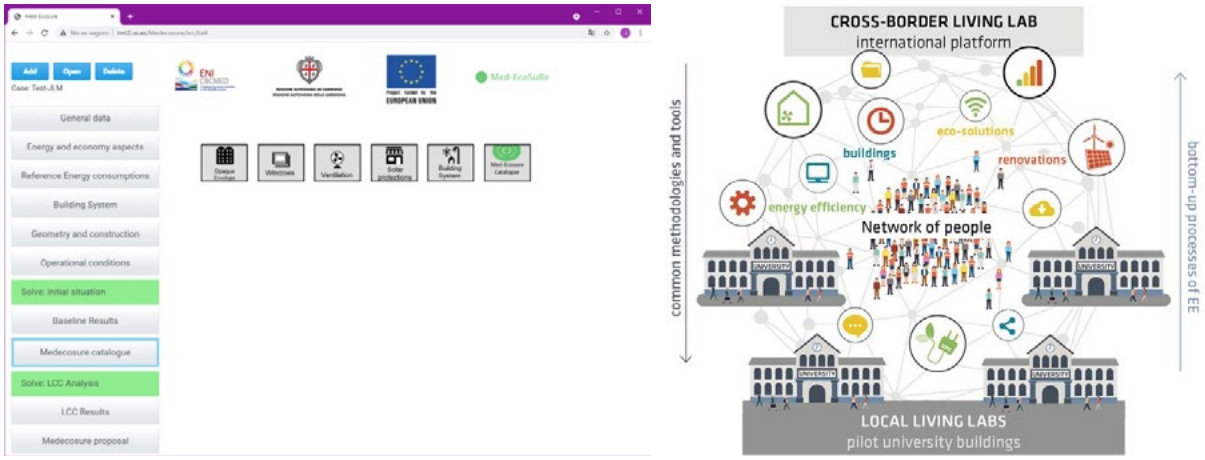

Fig 2: a. Entry point to the Energy Conservation Measures Catalogue; b.The Med-EcoSuRe Living Lab structure

6. How communicate the digital-green transition

The digital green transition will only be achieved as a collaborative effort involving several stakeholders, especially in the Mediterranean area which is characterized by very varied climatic conditions and implies specific approaches. In this regard, the project communication activities are mainly addressed to policy makers, building engineers and designers, students, general public, press and media: the objective is to disseminate and promote the innovation tools identified for energy refurbishment of university buildings in the Mediterranean area. In terms of communication, particular emphasis will be dedicated to the establishment of BeXLab - building environmental eXperience, project Living Lab composed by several stakeholders: a physical space for monitoring the level of comfort and a new way to analyze the performance of buildings, not only in technical terms (energy savings, CO2 emissions, etc…) but also in qualitative terms (well-being of researchers and university teachers).

7. Cross-border Living Lab

The Med-EcoSuRe project set-up a Cross-border LL, an international network of excellence, directed by partners and managed through a platform, that brings together the several Local LLs/ pilot university buildings in a common and integrated space, harmonized by common methodologies and tools, where to collaboratively develop innovation towards eco-sustainable energy renovation solutions for higher education institutions, within the specific climatic and cultural conditions of the Med area.
At the strategic level, the Cross-border LL is managed in order to connect partners with common visions, goals and approaches, to plan the network and the development process, to support collaborative testing on innovation, and finally, to sustain in the assessments and enhancement of the achieved benefits and impacts. The full implementation of Cross-border LLs requires three stages of LL networking: firstly, the exchange of best practices and lessons learned (learn from each other). Secondly, the setting of tools, methods or infrastructure to exchange comparable information (harmonization and integration) and finally the performing of joint research activities.
At this stage of the project, the Cross-border LL is working on the collection of international and Mediterranean best practices on strategies, technologies and approaches which produced eco-sustainable solutions for high educational buildings. The main foreseen output of the Cross-border LL is a Toolkit, an interactive, bottom up and participative program of training and education for technicians and students to implement a common knowledge and share cost-effective solutions for EE in university buildings in Med area.
Exploiting the knowledge of the actors and experts' community engaged in the network, the project collects and implements best practices, innovative scenarios and EE renovation measures, developing in parallel an international platform (ICT) combining physical and digital tools (Fig. 2b).

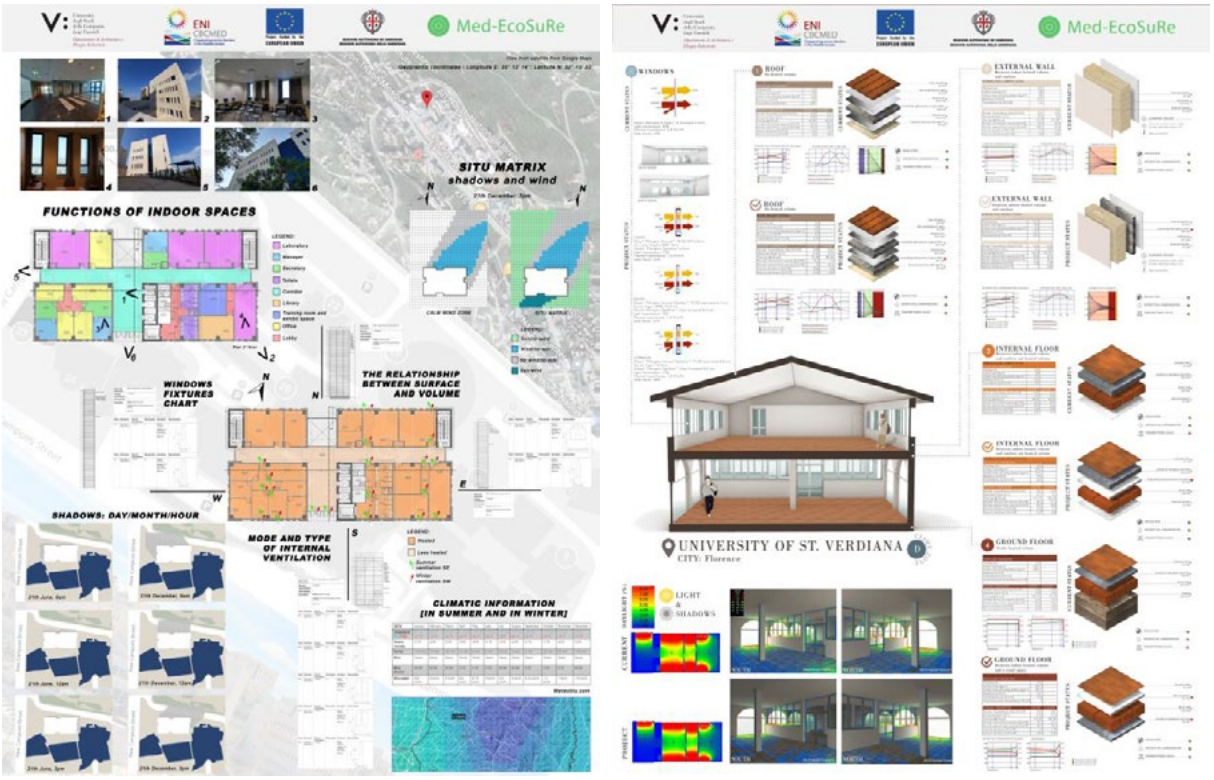

Fig 3. a. Project work on the An-Najah National university Building, Palestine; b. Project work on the S. Verdiana Building, Florence

8. The Energy Efficiency Action Plan Workshop

One of the steps to implement cross-border LLs is the exchange of best practices and lessons learned (learning from each other).
Existing university buildings need, to a large extent, to be extensively refurbished and even the least performing building stock will need to be strongly decarbonised by 2050. The role of universities cannot only be to educate about sustainability, but they also have the power and responsibility to practice sustainability. (Talloires Declaration, 1990). They are buildings (educational buildings) in which the learning of citizens (direct users) takes place and, in particular in the departments of architecture and engineering, the designers of the buildings of the future are trained (Owens, 2017).
On the topic of energy requalification of the Med-EcoSuRe Project's sample buildings, DADI (associated partner of the project) organised an international project workshop in which 55 students from four different universities participated: DADI, University of Campania "Luigi Vanvitelli"; An-Najah National University (ANNU)| Nablus - Palestine; National Engineering School (ENIT)| Tunis - Tunisia and DIDA - University of Florence. (Fig. 3 a-b)
The Workshop included 12 hours of theoretical lesson about the evaluation of the energy performance of existing school buildings, with the priority aim of illustrating a design methodology (e.g. integration of renewables, smart envelopes, ventilation systems, involvement of end-users, etc…) of approach to the technological project of energy efficient and effective redevelopment, and 24 hours of Graphic analysis and project work on one of the Med-EcoSuRe project case studies. Students will be guided by the teachers in the evaluation of the energy performance of the envelope and in the project of efficient technological solutions.

The use of technical tools, the application of project methodologies and the exchange of comparable information (harmonized laws and integrated technological solutions) leads to the implementation of joint research activities that have the added value of built-in internationalization.

9. Conclusion

In this Workshop finalized to the elaboration of an energy efficiency action plan in the Higher Education Building Sector, the research activity, inseparable from the teaching activity, has contributed significantly to the development of the educational process. So, we propose an interesting and alternative vision of innovation, with specific indicators that positively evaluate the didactic experiences that introduce new and original contents, whose value for the development of specific and transversal knowledge and competences is high. (Losasso, 2011) Among other things, this training action has used in a functional, conscious and critical way information technology tools for the widening of participation of students from different countries even in a period of pandemic crisis and has functionally involved actors and institutions outside the university (stakeholders), in an extra-European dimension. The contextualized and participatory quality of the didactic experience, assessed through a series of so-called Congruence indicators (Sposito&Violano, 2018), has returned a picture of the relationships and synergies between the educational system (themes, methods and tools) and the human capital receptor (objectives, needs, resources, technologies and skills) fully satisfactory.
The results of the research have oriented, qualified and substantiated the teaching, on the one hand with regard to the disciplinary content and on the other hand with regard to the methodological approach.

Acknowledgement

The contribution concerns the international research project Med-EcoSuRe, funded by ENI CBC MED programme 2014-2020. It is the result of a common reflection of the involved authors; in particular: S. Ferchichi and I. Khalifa on “Project Coordination” (par. 1); I. Ibrik on “The Energy audit” (par. 2); J.L. Molina on “Med-EcoSuRe software for Energy Audit” (par. 3); M. Cannaviello on “The tools to certify energy and environmental quality” (par. 4); N. Barbato on “How communicate the digital-green transition” (par. 5); A. Trombadore on “Cross-border Living Lab” (par.6); A. Violano on “The Energy Efficiency Action Plan Workshop” (par. 7) and “Conclusion”.

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University communities for the green/digital renovation of buildings

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Abstract

The paper shares the research-design experience behind the retrofit pilot-project of a Mediterranean university building, where beXLab is experimenting Digital Twins in a Living Lab context to innovate the building energy renovation process towards the tracked green and digital transitions. Exploiting the digital to support awareness on the energy and environmental challenges, the paper focuses on the multi-level methodology adopted to engage people in the pilot innovation/renovation process: from managers and decision makers responsible for university building and energy assets (survey) to the university community experiencing the Living Lab spaces, starting from students.
First results are showing that the need to deepen the knowledge on the impact of buildings on the planet and on humans can be addressed only by making people aware of the environmental quality of university spaces, and that digital tools can support this human transition towards a future sustainable buildings and cities.

Keywords

Green/digital transition, inclusive multidisciplinary approaches, digital twin, living laboratory, involvement toward awareness.

1. Introduction

In the era of the recognized irreversibility of human activities on the planet's health, buildings 'quality plays a strategic role, due to their enormous impacts on environmental sustainability, both in terms of energy consumptions and life-cycle carbon-footprint, as well as on human's health and wellbeing, also reminded by the pandemics experience.
The need to regenerate the built environment is made explicit in the commitment from the global scale, with the interrelated UN Sustainable Development Goals, to the EU policies and programs, starting from the Green Deal (EU commission 2019) to the Renovation Wave, evolving the Nzeb concepts towards positive energy buildings, also influencing with more ambitious targets the transformation of existing buildings, representing the most critical challenge.
Yet, if the green direction is traced and the requirements provided, the implementation in existing building projects and practices is still full of bottlenecks, also starting from the scarce digitalization of the building sector. Parallel to the Green, the Digital transition is considered an opportunity to enlighten the still *too grey* building processes with a new amount of shareable data and information for a "smart-sustainable" decision making across the whole building life cycle.
The pivotal role of people in such a context is well highlighted in the New European Bauhaus initiative, aiming at the promotion of participative co-design processes to inclusive envision collectively, towards beautiful future buildings and cities.
These are the challenges and aspirations of the experience shared in this paper, based on the settlement of a co-creation space in an university building in Florence, for the definition and implementation of innovative and eco-sustainable retrofit processes.

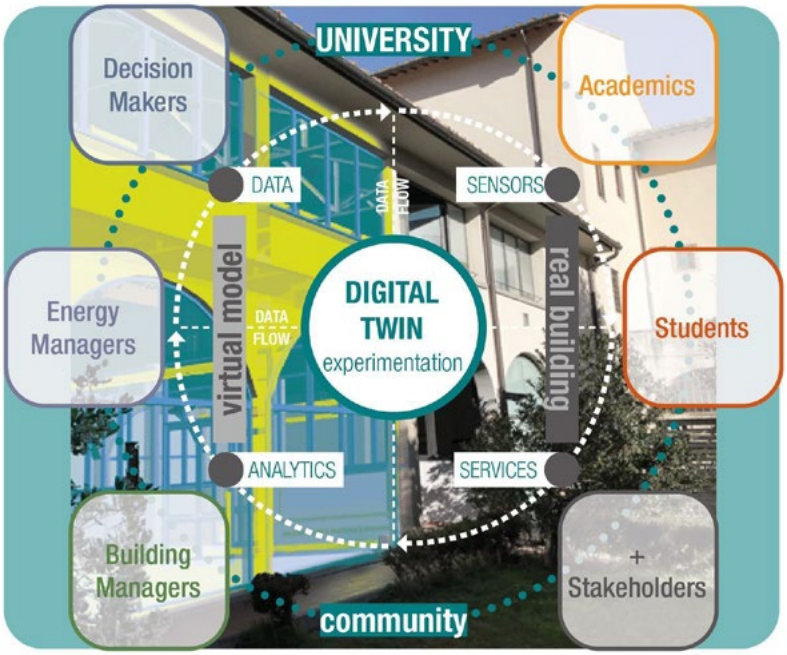

Fig 1. Twinned methodologies and actors participating in the retrofitting and awareness process.

2. Objectives

The paper shares the research-design experience of the pilot-project in the international research project Med-EcoSuRe, with the aim of describing the methodologies adopted and the promising first

Focusing on the unique Mediterranean socio-climatic context, the research project has the main objective to foster the role of universities as catalysts of innovative and eco-sustainable renovation processes in public buildings, by introducing a more collaborative approach for decision support (Trombadore et al. 2022).

To do this, the Italian team set up the university Living Lab (Nina et al. 2014) inside the Department of Architecture of Florence DIDA, in order to stimulate the collaboration and information exchange between the actors involved in the retrofit of the pilot case study, starting from building and energy managers/decision makers, but encompassing the whole university community (academics and their natural network of stakeholders, e.g. innovative companies), to finally involve students/users of common spaces.

In line with the EU objectives of a sustainable Renovation Wave merging the Green and Digital transitions, the Italian team is working on the most promising digital technologies for the building sector (from BIM to sensors and IoTs), sustaining their wide adoption for more reliable retrofit processes based on a new amount, quality and variety of data (e.g. existing and future building analysis and scenarios simulations), but also as an occasion to trigger more innovative and sustainable building lifecycles (e.g. operation and management).

Embracing the NEB initiative for more inclusive and participative co-design processes, the ultimate objective of the Living Lab is to create a *cultural, human centred and positive, "tangible" experience* of energy efficiency and environmental quality, where people can be aware of the impacts of buildings both on the planet as well as on people themselves, in terms of comfort and wellbeing. This co-creation space has been settled in the strategic university setting, where future generations of citizens, decision makers and technicians are growing up.

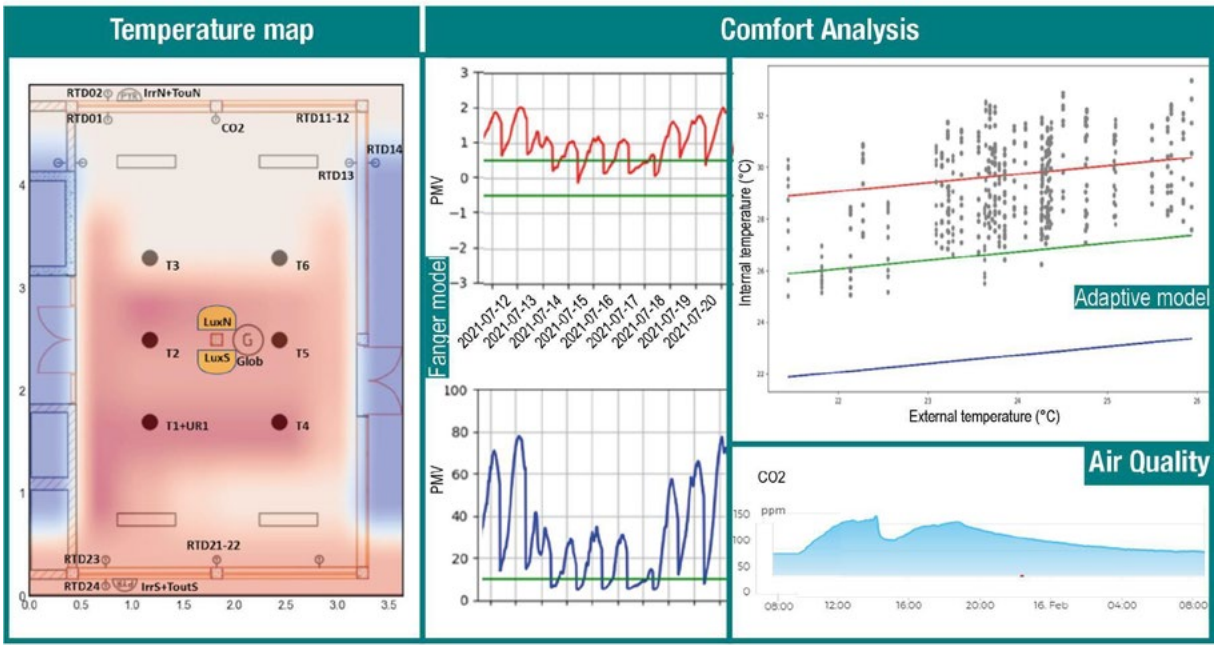

Fig 2. Data processing derived from lab measurements concerning thermal comfort and air quality.

3. Methodology

Considering the retrofit of an university building as a strategic innovation process, the research team promoted a multi-level Living Lab methodology, with a Mediterranean university network of excellence which operates locally inside university pilot-buildings, for a collaborative exploration, experimentation and evaluation of innovative and eco-sustainable retrofit schemes.

The innovative core of beXLab is the experimentation of predictive Digital Twins (Khajavi et al. 2019): the pilot-university building has been equipped with a real-time environmental monitoring systems (sensors and IoTs) and twinned with a virtual BIM-based building model for the calibration of energy and environmental quality simulations on the existing building and for the definition of the best "*mix-of-technologies*" retrofit scenarios (Trombadore et al. 2020).

Sustaining this core-experimentation, some practical methodologies were already set up in order to involve the university community in the definition of innovative and eco-sustainable retrofit processes, as soon as the living laboratory was created. They could be divided as follows:

1. *A survey for university building and energy managers/decision makers of Mediterranean universities*: it was carried out to understand the current practices for the refurbishment of public buildings stocks, and in particular the collaboration barriers. A detailed questionnaire was proposed in order to map the existing and to underline the "who-does-what" process in the management chain from the service offices to the highest decision levels. Moreover, the quality of available information was addressed aiming at demonstrating the importance of uniformity, standardisation and facility of keeping it shareable;

2. *Development of tools for the cross-elaboration of different measurement data for the internal comfort and wellbeing*: those post processing methods are necessary to aggregate multiple different data set-up (indoor and outdoor parameters obtained by sensors) and convert them into suitable information which represents the basis for the future analysis. A clear

Fig 3. Architectural solutions proposed during the design workshop

understanding of the output from experimentation, brings the digital twin model to be finalised and validated, leading the way to the re-design step. On the other side, the possibility of rendering the data in a more comprehensible form is the key for educational initiatives towards awareness and virtuous processes.

3. *A design workshop organised to engage university students in the co-design of the architectural solution for the retrofit of the pilot building*: the experience aimed at involving the main end-users of university spaces/students in the design phase of the university pilot-building retrofit project. Sharing the knowledge framework and analysis of criticalities on the pilot building, architectural students were introduced to the most traditional/innovative retrofit strategies and technologies for the Med area (i.e.. nature-based passive and active solutions - PV), and involved in the co-design of architectural solutions for their integration in pilot-building.

4. *A long-term survey has been drawn up to continuously retrieve subjective data from the university community on the environmental quality of the pilot building:* a questionnaire was compiled according to EN ISO 10551:2019 [4] and shared within the research group, at first. Thermo-hygrometric, lighting and acoustic issues were investigated from the point of view of the opinions related to the perception of environments as a function of personal activities and characteristics. These subjective contributes are continuously collected and are going to be compared with the objective parameters which are derived by direct measurements on site. The whole data matching will define a comprehensive view of the pilot (before-after the retrofit) in the BIM system.

4. Results and future works

The multi-level and multi-disciplinary methodology to innovate the retrofit process is an ongoing process that will last for years, beyond the pilot retrofit would be accomplished, e.g. keeping under control the monitoring phase for the building, for the user needs and behaviours, the operational maintenance of the Digital Twin system and forecasting replicability in other contexts.
The steps followed up to now have already highlighted some crucial, critical points, but also some opportunities.
First of all, a lack in the information about the existing is noticed at all the levels of the building management chain in the Mediterranean area. Fragmented data are present in different and non-homogeneous forms; the access is difficult as well as the capacity to fix a clear framework of the context of interest. Digitization processes have not started yet or they are partial anyway.
For these reasons the set-up of beXLab represented a breaking point, collecting a large part of missing information through direct measurements and especially promoting the building investigation within all its aspects.
Some data processing tools have been configured in order to derive robust information about e.g. the thermo-hygrometric characteristics and the air quality inside the laboratory, as shown in fig. 2. The implemented automathics algorithms merge the various sensors outputs and translate them to the common indexes for evaluating internal comfort such as the Predicted Mean Vote and the Predicted Percentage of Dissatisfied according to UNI-EN-ISO 7730 (2005).
In addition to the scientific contribution, the methodologies adopted allowed to involve people in the spirit of collaboration and innovation of the Living Lab, "forcing" them to become aware of the environmental quality of the university spaces and their current (managers) and future (students) role.
In the spirit of the NEB, the engagement of students in the co-design process permitted them to deepen their knowledge and understanding of current sustainability challenges (i.e. energy efficiency) and innovation opportunities to tackle them (i.e. digital technologies), also considering the architectural aesthetics of the retrofitted buildings.

5. Conclusions

Addressing the Med-EcoSuRe objectives, the described research-design experience suggested the need of going beyond buildings renovation to rethink human behaviours firstly, and that the green and digital transitions should be blended in a virtuous circle opening building issues to people (through the concept of inclusion, participation, awareness).
The complexity of the contemporary challenges for the built environment can be approached by combining quantitative and qualitative data in a more integrated way, not to define standard solutions, but to build a wide range of possible scenarios in which society can reflect its diversity, aspirations and desires. This requires a new capability of active “sensing” buildings, their environmental sustainability and comfort/wellbeing, as prerequisite for the construction of a common awareness which can support human-based and culturally appropriate building renovation processes.

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Metamorphosi$_{vs}$Transformation: innovating the process in the regeneration technological design of heritage-built environment

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Abstract

The New European Bauhaus, as a transition towards a sustainable, accessible and inclusive way of working, invites to combine creativity and valorisation in order to rethink living spaces enhancing their genius loci. Metamorphosis, evolution, transience, adaptability, resilience, perceptual-sensory involvement and quality are some of the keywords that outline a different way of relating to the built environment, which should be experienced and not used. This is the innovative approach to the regeneration technological design of the Ave Gratia Plena insula in Sessa Aurunca (CE), studied within the Research Project "The Mediterranean Bio-cultural Landscape".

Keywords

Regeneration, transitivity, cultural contagion, technological design, sustainable technologies

1. Introduction: self-regenerative circularity of physis

Much has been said about how to build adaptive capacities of a world in transition, where social vulnerability exacerbates ecological vulnerability (Folke C. et al, 2002). But architecture no longer wants to be used but lived, it co-evolves with its environmental surroundings and chooses as a unit of measurement of its performance the quality (Violano&Pozzi, 2019), not only the measured one, but also the perceived one. The new dimension of making architecture, conceived within the New European Bauhaus as a transition to a sustainable making (aiming at climate goals, circularity, zero pollution and biodiversity), beautiful (as well as functional), accessible and inclusive (valuing diversity and ensuring accessibility not only economic), introduces new watchwords such as: metamorphosis, evolution, transience, adaptivity, resilience, perceptual-sensory involvement and quality.

The perception of the natural and built environment's quality is strictly connected to experiences, sensibility and personal know-how and to the relationship that governs the use of anthropized and non-anthropized spaces. However, quality cannot be separated from beauty, and both cannot be separated from respect for practice (custom) and written norms; it is enough to think of Ambrogio Lorenzetti's frescoes, Allegory and Effects of Good and Bad Government (1338-1339), present in the Palazzo del Governo in Siena. The idea of norms to protect the community generates harmony that extends not only to the built urban space, but also to the man-made natural landscape. The Val d'Orcia, at the gates of both man and what will be contrasted to him as the sphere of culture and spirit only much later). (Violano, 2018)

Within the research project "The Mediterranean Bio-cultural Landscape", the theme of the resilient landscape as a process innovation in the interventions of rehabilitation of open spaces and urban regeneration has been analysed through the study of projects, to adapt to change. These projects consider the complex nature of the places, the identity characters carrying historical memory and local traditions, as well as the binding technical standards of physical and functional recovery of the built landscape. The research pays attention to the concept of resilient built environment as a strong point on which to focus in order to overcome the degradation and abandonment condition. The valorisation of the consolidated built landscape is entrusted to projects-strategies that consider the change of the territory, traditions and all those elements that characterize it by giving it an identity, through a

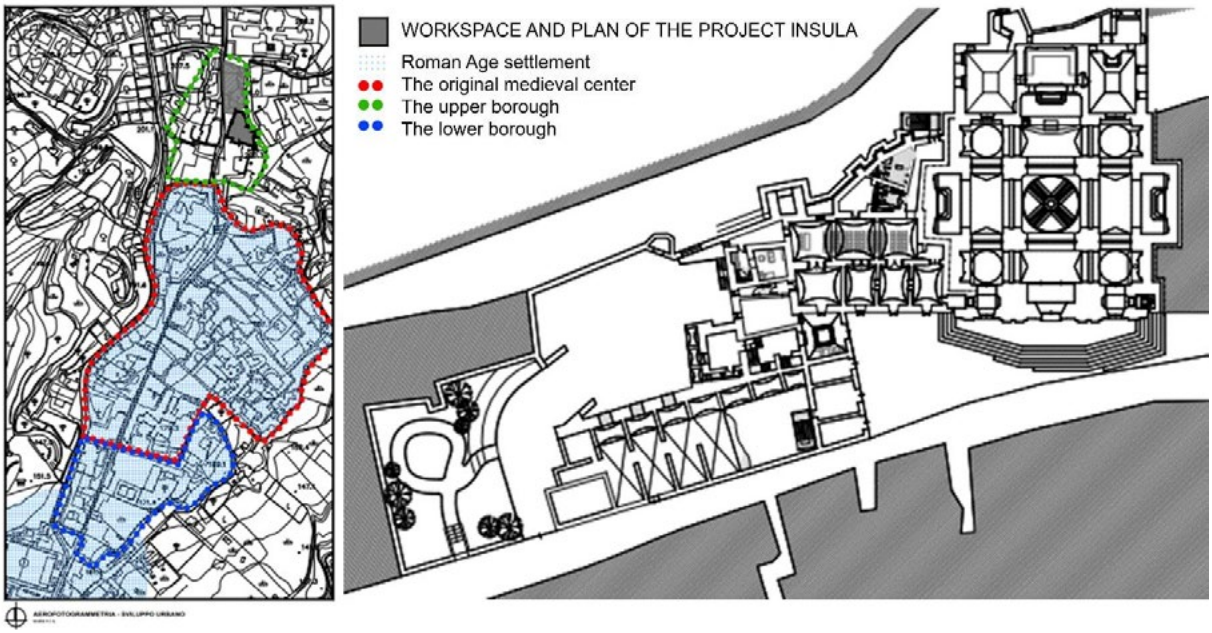

Fig 1. Workspace and plan of the project insula (credit: A. Maio)

regenerative and sustainable design.
The technological design of the regeneration of the Ave Gratia Plena (AGP) insula, in the historical building site of Sessa Aurunca (CE), moves in this context, with a view to sustainability and perceived quality of the built environment. It is an insula partly emptied following a demolition of historical environments and partly ruined due to abandonment and old age, including a large green space whose boundary wall, on one side, consists of the ancient medieval walls (Fig. 3).

2. The technological process of regeneration of the Ave Gratia Plena insula

The insula object of the intervention is placed inside the so-called "borgo superiore", outside the Roman area (Fig.1), built in the late Middle Ages and representing an area of expansion along the main street, Corso Lucilio, towards the North (Colletta, 1989). The area, to the east, was delimited by a defensive wall equipped with watchtowers placed along the perimeter, semi-cylindrical and square in shape, in part still present, inserted in modern housing or in view, as in this case. The wall of delimitation of the insula, to the east, is in fact partly incorporated in the built structures of the fifteenth century, partly in sight.
The entire site was built in the fifteenth century as a complex of the AGP, or with social welfare functions, and it included the church and rooms communicating with it and an appurtenant garden area. A series of rooms overlooking Via Taddeo Matricio were stores and laboratories. These spaces were arbitrarily demolished in October 2012, thus increasing the state of abandonment of the facilities.
In 2015, the whole area was given on loan to the Diocese of Sessa Aurunca, which launched a program of redevelopment of the entire insula, starting with the restoration of the church. An episode of the artistic history of the city that can not be overlooked is the construction of the church wanted by the arts of leather tanners and shoemakers, which is presented today, both in the plant and in the decoration, in its eighteenth-century appearance, as it was designed by the architect Domenico Antonio Vaccaro and completed by the architect and engineer of the Kingdom of the Two Sicilies, Giuseppe Astarita.
The project aims to recover the building through the use of the same materials present on site and their functionalization in compliance with the regulatory framework in force, through the adoption of consolidated technologies. The objective is the restitution of the insula to the community through the functionalization of services, such as reading rooms, auditorium and spaces for events and exhibitions, which allow a collective social use and a civic cultural reappropriation.
The building becomes the place of services and the demolished becomes the permeable memory of

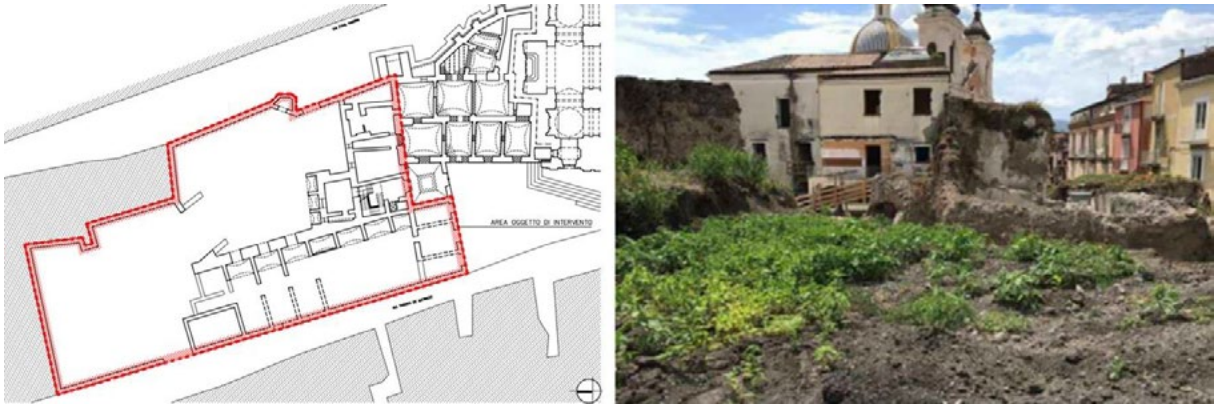

Fig 2. Garden area and destroyed spaces (credit: A. Maio)

access to the green space that is transformed into Ortus Conclus.
From the methodological point of view, the research team followed the steps already tested in other contexts in which the technological component had a strong connotative value. (Violano&Della Cioppa, 2017). The proposed interventions have been made starting from a "medical records" reporting the critically processed data in different cognitive stages, foundation of design choices:
1. Historical analysis: where elements on the building and its surrounding environment have been acquired from old documents, archival research and iconographic material,
2. Morphological and dimensional analysis;
3. Technological analysis: where the innovation compatibility verification is supported by the diagnostic phase with the aim of providing a "set of information" useful to identify the conditions of material integrability e recicling;
4. Structural analysis: that, starting from the transformations happened in the time, evaluates the state of conservation and the static compatibility of the integrations;
5. Conservative analysis: which has provided both the full cracking pattern and the methodological tools to look for the elements of value to be valorised.
The complexity of the design, in fact, puts emphasis on the problem of knowledge as a prerequisite both in the creative phase of the design and in the implementation phase of the construction site. The methodological approach is of need-performance type, to both investigate the cause-effect connections in the signs of deterioration/alteration seen and define the design requirements and prevent degenerative phenomena that may compromise the physical and historical integrity of the heritage.

3. From the process to the technological design

In the logic according to which a development can be said to be sustainable if it guarantees at least a balance between the short-term advantages of the individual/community/administration and the longer-term benefits for the entire community, it is necessary to identify tools, techniques and rules to develop not so much binding and coercive administrative-legal procedures, as design actions capable of following the entire cycle of Program - Plan - Conservation Project, so that it can meet socio-cultural as well as economic requirements (Amirante&Violano, 2006).
An articulated definition of the objectives of the recovery project introduces the analysis of the local users as the first phase, after the definition of the demanding normative apparatus of reference and the analysis of the characters of the existing urban structure.
In this way, the evaluation of the project's compliance with the regulations in force, the compatibility with the permanence of the peculiar characters of the existing urban system and the willingness of the direct users to accept the proposed changes are defined. Only after these verifications, the objectives of the intervention can really become rules of the local recovery project (Amirante&Rinaldi, 2002).
As part of a broader process of cultural redevelopment started by the Diocese, the recovery of the insula represents an example of reconversion of the built environment respecting the values and cultural processes underlying its construction. The start of the redevelopment represents the continuation of the

Fig 3. Back façade of the AGP structure attached to the church and the medieval boundary wall (credit: A. Maio)

process of "cultural contagion" in the awareness that an urban environment so redeveloped, i.e. respecting the norms and paying attention to the natural environment, can be an example of that intergenerational pact to save tomorrow.

The restoration of the church was only the starting point: the annexes have been refunctionalized paying attention to the sustainability of the intervention. The restoration is conceived as a sustainable process of recovery and enhancement of building elements through the use of materials not only compatible with the philosophy of restoration and having characteristics of sustainability, but also through the re-use of building materials present on site, selected from the materials of collapse. In the AGP project, particular attention is paid to the envelope starting from the roof, completely destroyed and re-proposed in the same morphology and with tiles and channels of reuse but equipped with a package of insulation strongly limiting heat loss ensuring a good physical efficiency and technical use of the attic, improved by natural ventilation guaranteed by the openings at the zenith and on the opaque vertical partitions.

The building no longer had any fixtures following the state of abandonment and collapses, so the project has pursued a morphological study of the types of closures attributable to periods of construction coeval with the latest transformations of the facades, in order to design new ones having on the one hand the aesthetic and morphological characteristics of a fixture compatible with the philosophy of restoration, on the other hand to require the same performance of adequate thermal insulation, and sustainability PEFC (Programme for Endorsement of Forest Certification Schemes) and FSC (Forest Stewardship Council) that guarantee products made from materials from forests properly managed from the environmental, economic and social point of view.

The few still existing horizontal wooden partitions have been recovered and made functional and suitable to bear the new loads, by means of steel grafts that have guaranteed and increased their resistance, allowing a considerable saving in terms of disposal costs and environmental sustainability. The hypogeal environments made usable again after the ruinous collapses, have brought to light other cavities near the large garden in which it is planned the installation of cisterns, integrated and concealed, fed by rainwater for the use of the garden.

The purpose of use of the complex, originally with welfare and social functions related to the AGP, retains its related functions in a contemporary key. The proximity to the square and the Castle places the complex in a form of antagonist and protagonist at the same time, becoming an incubator of social experimentation, an attractor capable of catalysing around it the contemporary trends and to support them.

Part of the rooms facing the square assume laboratory functions, as anamnesis of the workshops that were already present in the thirteenth-fourteenth century. They represented a point of reference near the market area, overlooking the Castle, an area where the city market still takes place today. Some of

the rooms become a space of communication and debate with the city, with the recovery of the rooms through the inclusion of an auditorium halfway between the hypogea dug in the tuff and what remains of the medieval stores. These rooms act as a hinge between the service block of the annexes to the church and the garden (Fig. 2), which becomes a filter area between the city to the west and the border represented by the medieval wall, restored and returned to the memory of the city. It is a narrative and inclusive park returned to the community with the inclusion of the typical tree species of the 'Ortus Conclusus' with rest areas and together with the building as an example of regeneration of an urban space in respect of the cultural identity of the place.
The commission pays particular attention to the use of these collective spaces, in order to make a return to the city and a cultural contagion through the use of the same for cultural purposes, even with temporary exhibitions, paths and uses that make understand the natural cultural vocation of the places. For these spaces the desire is to propose an opportunity for multi-sensory approach, not separated from an educational intent through a fruition plan also through the overcoming of architectural barriers according to three lines of action, or structuring the walkability of spaces in favor of users with mobility disabilities, interventions aimed at increasing the perception of space by the blind and visually impaired and general improvement of the use of areas, at the moment completely unusable.

4. Conclusion

Considering Culture and Heritage as a resource is linked to the possibility of their strategic and integrated use, within a horizon of wide territorial development. The aim is to promote the harmonious and balanced growth of the entire territory understood as an asset of cultural resources, leveraging the interrelationships between cultural heritage itself, the environment, economic realities and processes of civil growth, reconstituting the trigger of phenomena of cultural "contagion", generating economic wealth, cultural and "social beauty", urban regeneration as contagion of beauty. The relationship that exists between social and technological determinism and how the latter encompasses the "contemporaneity" and the mutability of technological culture, imposes needs, limits fragmentation and directs choices, so that we do not have "fossil landscapes" or "relic landscapes" (Angelucci et al, 2015), but triggers a process of "empowerment" that strengthens identity awareness and enhances diversity.
The cultural approach of the "society of care" gives the bio-cultural landscape an intrinsic strength related to raising the threshold of resilience of the historical-cultural ecosystem. Historic environments that have been destroyed due to neglect and pathological and functional degradation become the leverage point for triggering self-multiplying benefits. The restoration intervention was not limited to recover the structures, but to create a virtuous circle of reuse of materials.

Aknowledgement

The contribution concerns the "The Mediterranean Bio-cultural Landscape" Research Project, as part of the activities of the "Carbon Neutral Buildings" Research Group of DADI of the Università della Campania "L.Vanvitelli". It is the result of a common reflection of the involved authors: in particular, A. Violano on "Introduction: self-regenerative circularity of physis" (par. 1) and "The technological process of regeneration of the Ave Gratia Plena insula" (Par. 2) and A. Maio on "From the process to the technological design" (par. 3) and "Conclusion".

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Slow tourism and sustainable mobility: infrastructures for a smart use

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Abstract

The European strategies promote an acceleration of the transition to zero-emission mobility, thereby making it a priority to upgrade and modernise infrastructure and connection systems. At the national level, the resilient use of the urban fabric and the transformation of vulnerable territories into smart and sustainable cities are themes outlined by the National Recovery and Resilience Plan (PNRR), which envisages, among other reforms, investments in urban regeneration and territorial cohesion, with the strengthening of the National Strategy for Inner Areas (SNAI). Through the analysis of a study case resulting from an international research project, the presented contribution shows the possibility of a direct connection between the different realities of the innerland, characterised by a fragile infrastructural system, using a slow-mobility path, able to reactivate the local micro-economies and mechanisms that improve the attractiveness and catalyse flows of visitors and requalify the disused or abandoned built heritage.

Keywords

Inner Areas, Refunctionalisation, Tourist network, Slow-mobility.

1. Introduction

The transport sector is the world's largest emitter of carbon dioxide into the atmosphere, so there is a need for innovative systems, techniques and policies for the development of sustainable mobility [Moosmann *et al*, 2021] to play a key role in the decarbonisation process. The total amount of emissions is still higher than 1990 levels, which is why the European Commission's target is to reduce pollutant emissions by 90% by 2050 in order to achieve carbon neutrality.

At European level, a number of initiatives are in place to guarantee a fair, competitive and green transition by 2030, in several policy areas, including transport. Environmentally sustainable mobility promotes the use of electric vehicles and an increase in the recharging infrastructure network, as well as accessibility to transport for people with reduced mobility and a decrease in the cost of accessing transport [Balsalobre-Lorente *et al,* 2021]. To this end, it is essential to implement urban matrix interventions by optimising and integrating them with existing infrastructures, improving internal connections and thus making mobility infrastructures more efficient, not only from an economic and social point of view, but above all in environmental terms.

In this context, Italy, through the introduction of the National Recovery and Resilience Plan (PNRR), identifies among its priority needs, the creation of an urban welfare that guarantees fundamental rights for health, the environment, the city and public mobility, as well as the construction of networks of public services and infrastructural spaces for sustainable and inclusive mobility, focusing in particular on territorial cohesion and the strengthening of the National Strategy for Inner Areas (SNAI).

Fig 1. Identification of the slow mobility route between the municipalities examined | upper figure: territorial framework, lower figure: cross section of route (Kamoot site and Author's re-elaboration, 2022)

2. Inner Areas and slow mobility

Inland areas with great cultural, architectural and landscape potential represent a large part of the national territory. Participation in the international DAAD research project "Green Ways" has made it possible to characterise the territories in the hinterland of the Cilento National Park, which have a fragile economic system and an inadequate infrastructure network that increases the difficulty of interaction with the centres offering services.
The valorisation and revitalisation of these areas are fundamental themes for achieving synergies that aim to repair the urban texture, filling the infrastructure and mobility deficit. The use of investment funds made available by the European Union for the development of these rural areas is a chance not to be missed that will make to support coordinated actions in the areas of sustainable, responsible and quality tourism, promoting a new way of using the cultural and territorial heritage [Fistola *et al,* 2018].
The contribution proposes the development of a cycle route connecting the inland municipalities and integrating it into the existing road system [Fig. 1]. From the territorial analysis it emerges that the route under examination, which connects the two municipalities, is flat with non-invasive altimetrical excursions, with a distance of 2.78 km in a maximum time of fifteen minutes each way, resulting accessible to every class of users. The refurbishment of the buildings identified on the section in question, which are in a state of abandonment or disuse, provides equipment and assistance points for users of the cycle/pedestrian path. The concept of sustainability is thus placed in the foreground, not only in environmental terms but also in terms of intermodal and soft mobility, the creation and innovation of tourist products and the consequent development of local economies.

Fig. 2 Photo-integration of the project for the refunctionalization of disused buildings (Author's elaboration, 2022)

3. Functional reuse of disused buildings

The design of a network connecting municipalities in the hinterland promotes the adoption of sustainable infrastructures, the result of a scientifically based methodology that enables it to be replicated in other similar contexts. The network, projected in this research activity, valorises the cultural and natural heritage, thinking about a new functionality for the disused or abandoned built heritage and laying the foundations for the birth of new working realities to contrast the depopulation of the small inland centres. Along the road that connects the municipalities of Magliano Vetere and Magliano Nuovo, in the Cilento Vallo di Diano and Alburni Park, there is a disused building in an advanced state of structural decay. Located at the edge of an oak forest, according to cadastral data obtained from the *Agenzia delle Entrate* database, it appeared to be a factory, but the type of property converted is unknown. It is on two floors, and consists of a ground floor and a first floor, occupying a total area of approximately 80 square metres. Its location and size, as well as its original intended use, make it suitable for re-functionalization as an Assistance Point for users [Fig.2]. The constructive recovery of the structure, in accordance with existing regulations, involved a functionally oriented design of the interior spaces conceived to support the cycling infrastructure. On the ground floor of the building, the spaces are designed as collateral facilities to serve bike tourism: equipment for assisted bicycle repair, stands, counters and tools to facilitate self-repair. In the outdoor areas, the project provides charging columns for hybrid, electric or pedal assistance vehicles. On the upper floor there is a refreshments area and an infopoint, useful for slow tourism users.

4. Conclusion

The new approach to sustainable and integrated mobility planning, including a network of cycling and walking routes for small inland towns, offers new ways of experiencing the area and enjoying the landscape by promoting new types of entrepreneurship. Serving rural territories with an adequate mobility network, creating connections with large urban centres, canalises the tourism flows that are attracted by the quality of travel that such services can offer [Rau *et al*, 2020] appreciating local resources and experiencing the cultural elements present in territories that are not really of common interest, through slow mobility enjoying a anthropic and natural landscape from a different point of view. Moreover, the use of a disused living space brings back the principles underlying the C2C concept, including the adaptation of space to changing needs over time, through the reoccupation of underused and disused buildings, designing environments that can be modulated according to needs, without totally compromising the existing structure and the existing biological sphere.

After all, the valorisation of the existing natural and anthropic heritage is no more than a stimulus for responsible development, which: " satisfy the needs of present generations without compromising those of future generations, safeguarding the natural capital itself". [World Commission on Environment and Development, 1987].

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06 Structural engineering

Seismic vulnerability assessment of ten bell towers in Naples

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Abstract

Italian landscape is characterised by large spread of monumental constructions, which may represent a driving force for the development of local territories. In this context, bell towers are notably present in any town, and their artistic cultural value must be preserved, in particular by enhancing structural safety and fruition for inhabitants and visitors. Within this vision, the University of Campania "Luigi Vanvitelli" has funded the research project PREVENT, aimed at the evaluation and conservation of historical masonry bell towers, assessing and increasing their structural, physical and mechanical resilience, in order to enhance their fruition opportunities.
In this paper, several masonry bell towers surveyed in the city of Naples are analysed and assessed through a simplified procedure suggested by the Italian building code and implemented in an in-house software package. The bell tower characteristics governing the seismic vulnerability are identified, and specific further developments envisaged.

Keywords

Seismic assessment, Territorial level, Vulnerability, Masonry, Collapse.

1. Introduction

Italy is the "Country of bell towers": almost every city, hamlet or district, as well as every basilica or cathedral, has its own. Despite their high identity and artistic value, the lack of a policy aimed at their conservation and cultural valorisation in many cases does not allow their fruition, causing a significant impact on the local economy and tourism. Given the spread of such important landmarks, methods aimed at vulnerability assessment at territorial scale may give important information for the definition of intervention prioritization rankings at policymaking level.
In this context, the research project "PREVENT - Integrated PRocedure for assEssing and improVing the resilience of existing masonry bell Towers at territorial scale", funded by the University of Campania "Luigi Vanvitelli", aims at the evaluation and conservation of historical masonry bell towers, assessing and increasing their structural, physical and mechanical resilience, in order to enhance their fruition opportunities. In this paper, ten bell towers in the city of Naples, extracted from a larger population (Cacace, Chisari, & De Matteis, 2021), are described following on-site surveys. A numerical tool evaluating the seismic response of bell towers is presented and is used to perform a comparative assessment of the seismic strength of such structures due to their main geometrical and typological configuration.

2. Description of the bell towers

The bell towers shown in Fig 1 were directly surveyed and, where possible, further information was obtained from historical documentation. Not always the towers were completely accessible, implicitly highlighting the importance of further work to enhance their fruition by the public. In general, the structural survey regarded the level of restraints of adjacent buildings, determination of wall thicknesses, masonry type and stratification/constructional heterogeneity, type of slabs/floors, staircase, openings, bells, presence of vulnerability elements / anti-seismic devices, possible later interventions. The main characteristics are reported in Tab I.

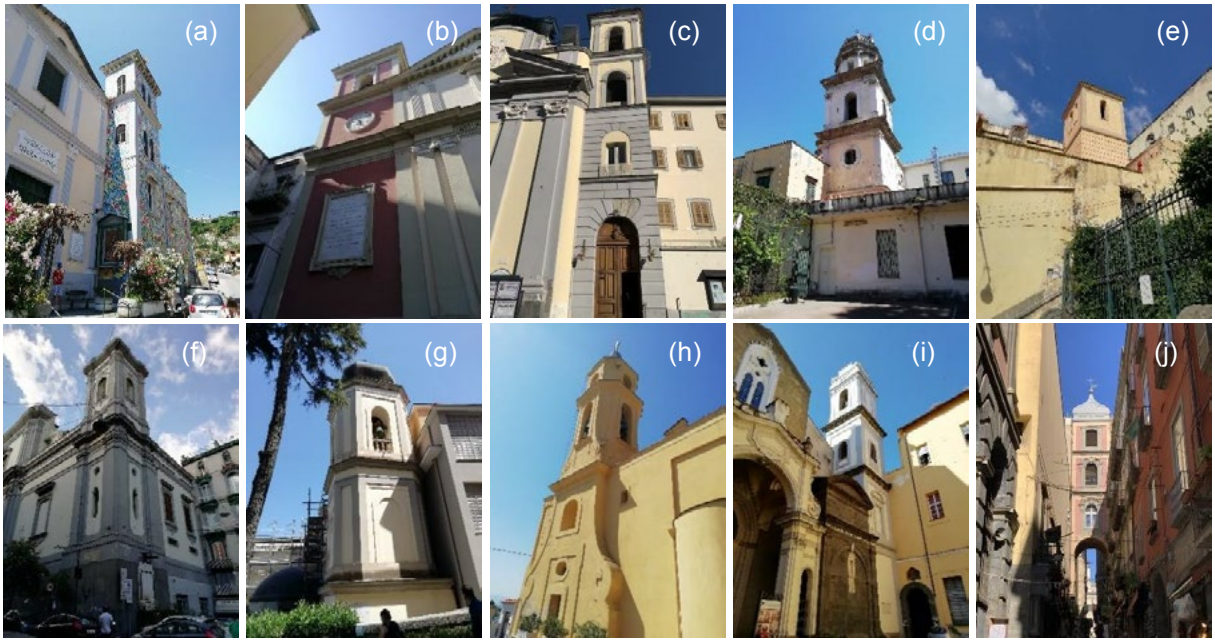

Fig 1. The ten bell towers surveyed: (a) Maria Santissima del Carmine, (b) Santa Maria della Pazienza, (c) San Pasquale a Chiaia, (d) Santa Maria in Portico, (e) San Nicola da Tolentino, (f) San Giorgio Maggiore, (g) San Luigi Gonzaga, (h) Santa Maria del Faro, (i) San Domenico Maggiore, (j) San Gregorio Armeno

Tab I. Geometric characteristics of the bell towers.

Bell tower	Total height [m]	Embedded height [m]	Plan dimensions [m]	Wall thickness [m]
Maria Santissima del Carmine	20.0	11.7 on W side, 14.5 on E and S side	8.15×5.6 (shaft), 3.3x5.6 (belfry)	0.8 (base), 0.7 (belfry)
Santa Maria della Pazienza	31.4 (5.4 below ground level)	12.8 on W side, 19.1 on E and S side	6.2×6.1	1.05
San Pasquale a Chiaia	20.0	15.3 on W side, 14.2 on N side	4.0x5.3 (shaft), 3.5×4.2 (belfry)	0.7 (base), 0.5m (belfry)
Santa Maria in Portico	37.3 (5.7 below ground level)	15.9 on E side, 14.6 on S side, 4.85 on N side	6.5×6.0	1.5 (base), 1.2 (belfry)
San Nicola da Tolentino	17.1	12.7 on W side, 5.4 on E side, and 7.9 on N and the S side	5.7×4.4	1.0 (base), 0.7 (belfry)
San Giorgio Maggiore	29.4 (5.6 below the ground level)	19.3 on E and N side	6.1×6.1	1.9 (belfry)
San Luigi Gonzaga	27.6	16.1 on E side; 20.7 on S side and 5.1 on W side	6.1×6.5 (shaft), 5.2×5.2 (belfry)	1.3-2.0 (base), 0.9m (belfry)
Santa Maria del Faro	18.9	7.6 on N-E side and 9.2 on S-W one	4.0×4.0	1.1-0.8 (base), 0.6 (belfry)
San Domenico Maggiore	42.7	20.0 on all sides	5.6×5.8	2.3-2.6 (shaft), 1.1-1.6m (belfry)
San Gregorio Armeno	35.2	20.0 on W side and 25.7 on E side	6.2×5.2	1.0-1.6 (level 1), 1-1.4 (level 2), 0.95 (level 3)

Maria Santissima del Carmine

The church, built around 1880, is located in the Sanità District, at the base of a big tuff spur ending by the south side of the church. The tower is partly emerging with respect to the façade of the church, while on the other side there is continuity with the adjacent structures. An interesting characteristic of the bell tower is represented by the superimposed rectangular belfry, which starts from level 3 of the shaft and has a reduced cross section. The masonry bond is characterised by large cut tuff blocks with regular horizontal mortar joints and filled but irregularly spaced head joints.

Santa Maria della Pazienza
The Basilica, located in the neighbourhood Avvocata, was founded in 1602. The bell tower is located at the left of the church façade. The masonry bond is not visible in the shaft, but presence of brick masonry has been observed at the basement. Hollow-blocks floors were detected at the intermediate floors and the roof. Four arched openings, approximately 1.5m×2.9m, are in the belfry and only one, partially walled, is in the shaft.

San Pasquale a Chiaia
The church is located in the Chiaia district. The religious complex has undergone numerous alterations during its history and appearing today in neo-classical style. Some restoration works were carried out on the entire church in the aftermath of the 1980 earthquake. The bell tower is located at the S-E corner of the church. A barrel vault followed by a cross vault are present at level 0, while, at level 1, a barrel vault with lunettes was observed. In the other levels, the floor systems are sustained by steel beams. Yellow tuff masonry and bricks were observed in limited parts of the walls. The openings are vertically aligned and distributed at all levels on almost all sides, with an average opening width ranging from 1m to 1.3m.

Santa Maria in Portico
The church, dating back to the 1645, is also located in the Chiaia district. The bell tower is at the N-W corner of the church, at the opposite side of the façade. The bell tower presents a basement, three levels above the base, a belfry and a superimposed octagonal drum ending with a little bulb dome. A concrete slab divides level 3 into two floors. Some limited uncovered areas reveal the presence of yellow tuff masonry in the walls, and bricks for the emerging pillars at the four corners. The average opening width is around 0.75m.

San Nicola da Tolentino
The religious complex, built in the 17th century, is located between the Vomero and Montecalvario neighbourhoods. The bell tower is located on the E side of the church with level 0 and 1 being actually part of the church. At the ground floor a barrel vault is present. The roof is constituted by a planar timber slab. Yellow tuff masonry is visible in some points of the belfry.

San Giorgio Maggiore
The church is located in the historical centre, and has early Christian origins, as evidenced by the 5th century AD apse. The bell tower was rebuilt in the 19th century, following the city rehabilitation project. The structure slightly emerges in plan with respect to the church. The entrance to the structure is at level 0 from the church, and a masonry spiral staircase, with 2m diameter, serves the belfry, characterised by 1.2m ×4.2m openings. Some photos of the bell tower without plaster, dating back to 1979, show a homogeneous yellow tuff masonry arrangement with regular blocks. As reported by the archival documents, the bell tower has undergone structural restoration works after the 1980 earthquake, with insertion of tie rods and jet grouting.

San Luigi Gonzaga
The religious complex is located in Posillipo district. The bell tower, dating to the 1743, was built on the pre-existing structures of an ancient Saracen watchtower, and is now located on the S-W corner of the church. A barrel vault is present at level 0, while Level 1 is conversely covered by a cross vault. The whole structure is in yellow tuff semi-regular blocks, as is the ogival bulb that crowns the belfry. Very small openings are present on almost all sides and are vertically aligned, while the belfry is characterised by 1.3m×3.5m openings.

Santa Maria del Faro
The church is located in the village of Marechiaro. The construction of the bell tower is part of the reconstruction phase of the religious building, dating to around 1720. It is included in the church structure on three sides with different constraint levels, and slightly emerging on the fourth, representing the original entrance, now walled. Two different types of masonry were observed: (i) tuff masonry with small blocks, thick horizontal mortar joints and irregularly spaced filled vertical joints,

and (ii) brick masonry with thin units and thick mortar joints. The ceiling at the second and third levels revealed a vaulted structure with tuff blocks. The average opening, present at all levels except the second, has 1.5m width. The bell tower underwent recent restoration works, and it is possible to notice a general good condition of the structural parts, with steel tie rods distributed along the height.

San Domenico Maggiore
The monumental complex is located in the Historical Centre. The foundation of the church dates to 1283, but a long series of renovations and stratifications were carried out over the centuries; the bell tower was demolished and rebuilt in the 17th century. The access to the bell tower is allowed from the first level (+ 17.25m) by an external staircase, while the lower part of the shaft is not accessible and presumably empty. The main material of the bell tower is masonry tuff blocks with brick courses.

San Gregorio Armeno
The religious complex, born as a cloistered convent, is located in the Historical Centre. The bell tower, dating back to 1025, stands on the homonymous street through a large arched passage, consisting of a barrel vault with lunettes on a 3.40m×4.20m base, having 13.50m height at the key. On the lateral sides of the base, the walls of the continuous façades of the bordering buildings act as restraining elements. Timber slabs were observed at levels 1-3. Tuff masonry is visible in some uncovered areas of the walls; the uppermost level is covered by a characteristic bulb dome. Large openings, of 2m width and 3-3.5m height, are generally present on all sides.

3. Vulnerability assessment tool

With the aim of performing a vulnerability assessment of the bell towers, a software package was developed (Fig 2). This, mainly written in Python, enables the parametric creation of a geometrical model of the tower through a Gmsh script (Geuzaine & Remacle, 2009), on which safety checks according Evaluation Level 1 (EL1) of the Italian Guidelines are performed (Ministero dei Beni e le Attività Culturali, 2010). In particular, this evaluation level models the tower as a cantilever hollow-section beam made of no-tension material, subjected to a horizontal force system equivalent to the ground motion. The Ultimate Limit State (ULS) resisting bending moment of the *i*-th cross-section, $M_{u,i}$, located at height z_{i*}, governs the spectral acceleration $S_{e,ULS}^{i}$ which can be resisted by the bell tower:

$$S_{e,ULS}^{i} = \frac{q\ g\ M_{u,i} \sum_{k=1}^{n} z_k\ W_k}{0.85 \sum_{k=i}^{n} W_k\ \left(\sum_{k=i}^{n} z_k^2\ W_k - z_{i*} \sum_{k=i}^{n} z_k\ W_k\right) F_C} \quad (1)$$

where *n* is the number of sectors composing the bell tower, having barycentre height z_k and weight W_k, *g* is gravity acceleration, *q* is the behaviour factor, conventionally assumed equal to 3, and $F_C = 1.35$ is the confidence factor for the minimum level of knowledge, adequate for this level of investigation.
The resisting bending moment $M_{u,i}$ is evaluated differently depending on the type of collapse expected, and depends on the material characteristics of masonry. Since in most cases yellow tuff was observed in the bell towers surveyed, the minimum values provided by (Ministero delle Infrastrutture e dei Trasporti, 2019) for soft stone regular masonry were used in all cases in combination with a partial safety factor γ_M=3. It is clear that more in-depth investigations would allow for better characterisation of the materials, and thus the comparison reported here has only an indicative value.
Knowing the minimum spectral acceleration $S_{e,ULS}$ of the bell tower, through the estimation of the fundamental frequency from literature relationships (Diaferio, Foti, & Potenza, 2018) and the definition of the design spectrum, it is possible to obtain the collapse peak ground acceleration (PGA). The results for the ten bell towers investigated here are reported in Fig 3.
slender tower, respectively. Particular attention should be paid to the correct definition of the lateral restraints, as they considerably govern the lateral capacity. It must be noted that the method may not give fully realistic values in particular cases (such as Maria Santissima del Carmine) where the presence of inside walls and strong irregularities in plan were surveyed.

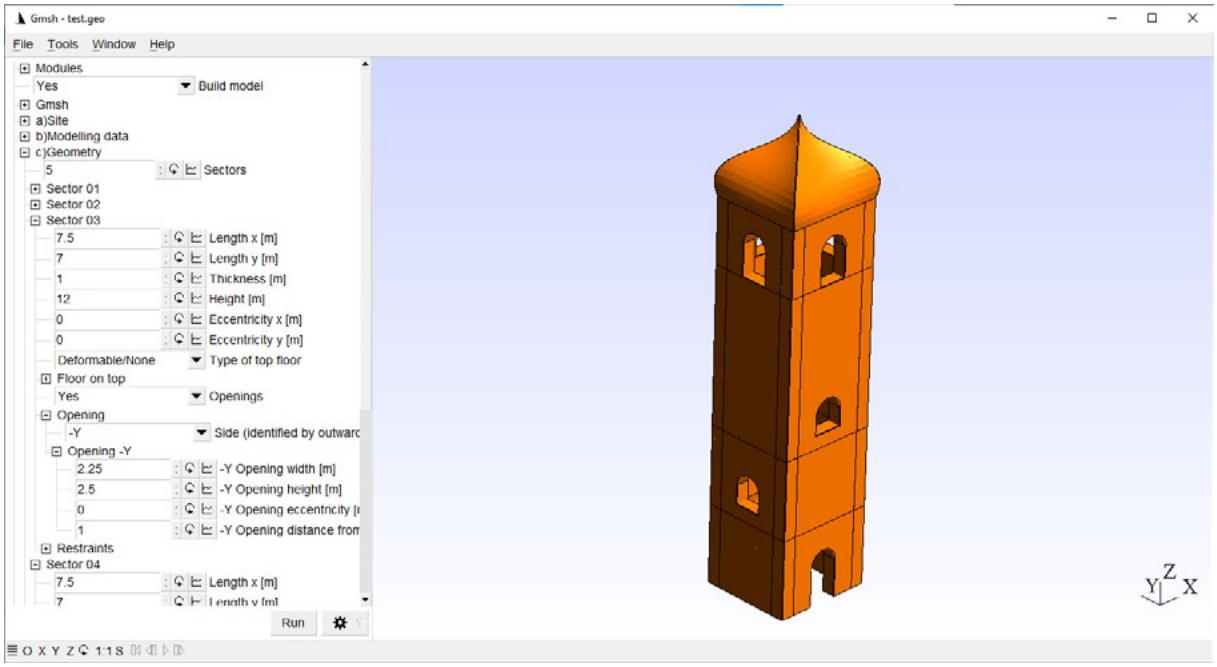

Fig 2. The graphical interface for the parametric description and vulnerability assessment of bell towers.

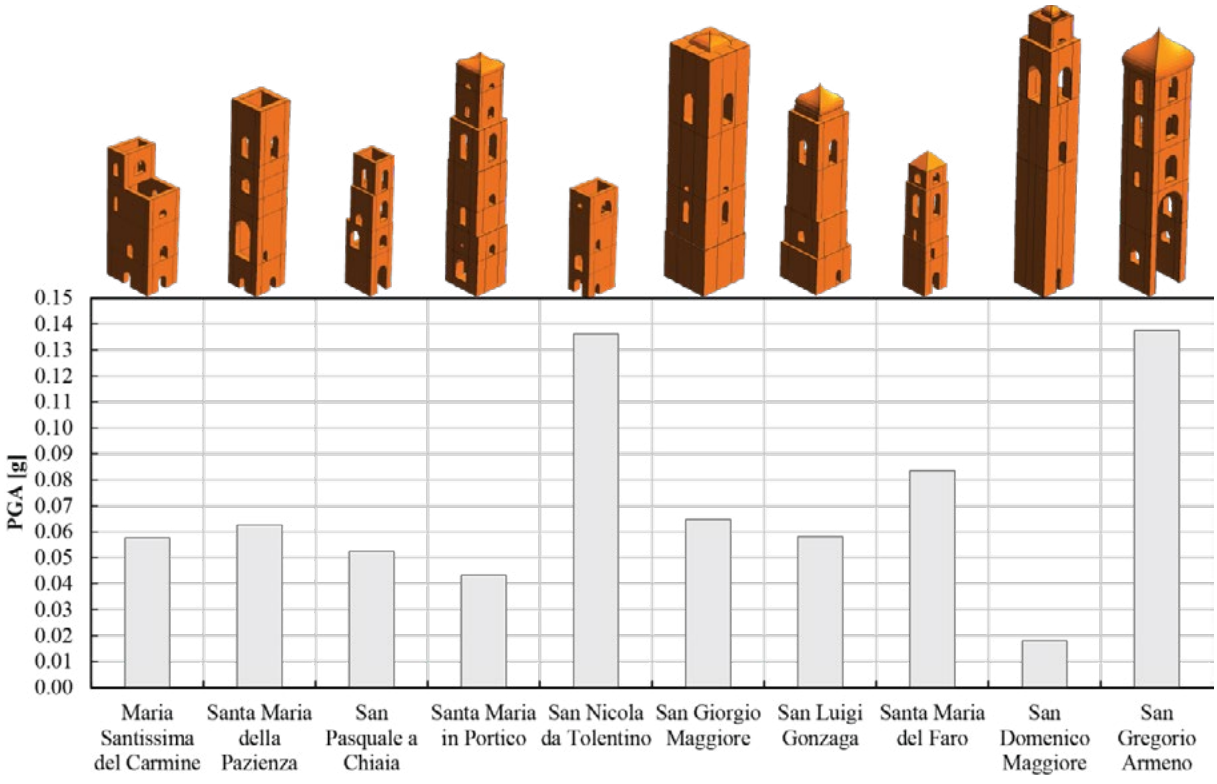

Fig 3. Resisting peak ground accelerations (PGA) obtained for the investigated cases.

4. Conclusions

In this paper, ten bell towers in Naples have been investigated through on-site inspection and structural modelling, in order to assess their seismic vulnerability at territorial scale. The study entailed the development of an in-house software package for the application of the EL1 assessment method suggested in the Italian code for masonry bell towers. Owing to the simplicity and the limitations of the method, this application showed how it can be profitably adopted for prioritization processes aimed at identifying the riskiest structures. Ongoing research is exploring the application of the tool for the identification of the parameters governing the seismic response of existing bell towers and the development of appropriate EL0 vulnerability models.

Acknowledgements

This work has been carried out within the activities of the research project “PREVENT - Integrated PRocedure for assEssing and improVing the resiliENce of existing masonry bell Towers on a territorial scale”, funded under the VALERE 2019 program by the University of Campania “Luigi Vanvitelli”. C.C. is funded by MUR (Ministry of University and Research) through PON FSE 2014-2020 program (project AIM1879349-2). M.Z. is funded by MUR (Ministry of University and Research) through PON FSE 2014-2020 program (project CUP: B61B21005470007).

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The role of the epistyle on the dynamic behavior of multi-drum columns

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Abstract

The aim of this work is to investigate the dynamic behaviour of structures with multi-drum columns under a single epistyle. For that, the paper studies numericaly the complex 3D dynamic response of a standalone multi-drum column and of two columns with a single epistyle, by using the FE code MARC. The studied columns are part of the colonnade system of the ancient Messene Gymnasium in Greece. Parametric studies are implemented in order to investigate the effect of the excitation characteristics on the behavior of the columns. The results indicate that at low frequency excitations the response is dominated by rocking, whereas at high frequency excitations sliding is predominant. Between these two extremes both rocking and sliding apear. In both cases the acceleration needed to overturn the multi-drum columns increases as the frequency increases. Finaly, the parametric analyses show that the colonnade system with a single epistyle requires higher accelerations to overturn.

Keywords

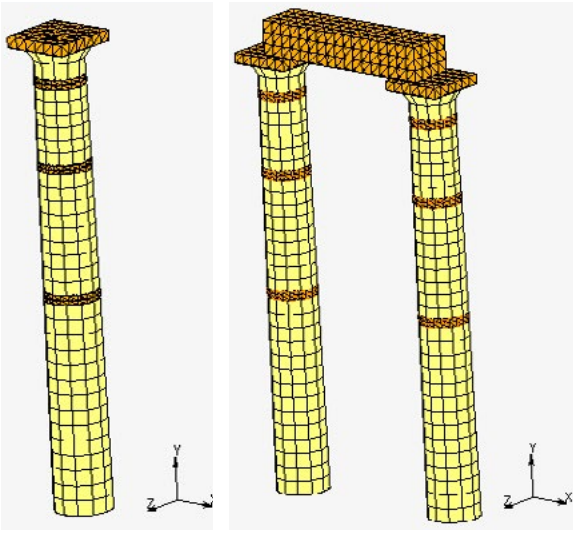
Multi-drum columns, epistyles, harmonic ground excitations, 3D dynamic response

1. Introduction

During the last decades, the earthquake response of ancient structures, which are in areas with high seismicity, has attracted the attention of the researchers. Of particular interest is the response of the multi-drum columns (Zhang & Makris 2001, Psycharis et al. 2003, Konstantinidis & Makris 2005, Papaloizou & Komodromos 2009) which are parts of the classical temples that are found in Greece and Southern Italy and occasionally are under epistyles. During seismic shaking the drums can slide and/or rock independently, making more complicate the dynamic response of the columns. Experimental studies (Drosos & Anastasopoulos 2014) confirm that even for purely plane excitations, significant out of plane displacements appear at multi-drum columns. Moreover, in some cases, the predominant residual deformation of the column was in a different direction from the direction of the excitation. Therefore, to consider this behavior of multi-drum columns, 3D numerical analyses should be adapted. The present paper examines the 3D motion of multi-drum columns in both cases, of standalone columns and of a colonnade under a single epistyle. The models are subjected to harmonic ground accelerations with different characteristics, in order to investigate their effect on the behavior of the multi-drum columns. Under this framework, the dynamic response of the columns is studied in detail and useful conclusions are derived, concerning the role of the epistyle to their stability.

2. Description of the studied colonnade

The structures of interest are classical multi-drum columns from the western colonnade of the Gymnasium of Ancient Messene. They consist of three drums and a capital on the top. In all cases the height and the diameter of every drum decreases as the height in which it is installed increases.
The capital has a variable geometry, starting from a circular cross section of d_{min}=0.45m, which progressively is transforming to a 0.61m square cross section. The geometrical properties of the drums and the capital are listed in [tab. I]. The length of the epistyle is 1.91m, its width 0.45m and its height 0.335m. Linear elastic behaviour was assumed for all structural elements with modulus of elasticity E=40Gpa, Poisson ratio 0.20 and mass density of 2.7 ton/m^3.



(a) Standalone columns

(b) Two columns under an epistyle

(c) The harmonic ground excitation

Fig. 1. The 3D Finite Element models and the ground excitation

Tab I. Geometrical properties of the drums and the capital.

drums	drum 1	drum 2	drum 3	Capital
height	1.90	1.15	0.75	0.40
d_{max}	0.52	0.49	0.47	
d_{min}	0.49	0.47	0.45	0.45

In order to simulate the dynamic response of the columns, the 3D finite element models presented in [fig. 1a] and [fig. 1b], are constructed, by using the FE code MARC. The base was simulated with a rigid surface and in all interfaces the "touching" contact type was assumed. The tangential behaviour of all interfaces was modelled by assuming a Coulomb model with a friction coefficient μ=0.7. In order to examine the influence of the excitation characteristics to the dynamic response of rocking systems, the 3D FE models were subjected to various harmonic excitations at their base in *X* direction, given in [fig. 1c].

3. Dynamic response of the multi-drum columns

This section presents representative results of the dynamic response of the standalone multi-drum column and of the system of two multi-drum columns under a single epistyle. The study is focused on (i) the numerical predicted deformed shapes of the columns and the epistyle given in [fig. 2] and (ii) the distribution with column height of maximum rotations and maximum displacements given in [fig. 3]. Different sequences and acceleration amplitudes of the base excitation are assumed, to highlight the effects of these parameters on the dynamic response of the columns.

3.1 Dynamic response of the standalone multi-drum column

The computed deformed shapes of the standalone column given in [fig. 2] verify that, high frequency motions require large base acceleration amplitudes to cause rocking and sliding between the drums of the column. Moreover, lower frequency motions lead to more intense rocking with significant out-of-plane response of the drums. In [fig. 3] the in-plane and out-of-plane response of the column for different base excitations, in terms of distribution with height of maximum rotations θ_z, θ_x and maximum displacements U_x, U_z is presented. It is recorded that, lower frequency motions lead to more intense in-plane and out-of-plane rocking of the column. In fact, in some cases the predominant rocking and sliding of the column was in the out-of-plane direction.

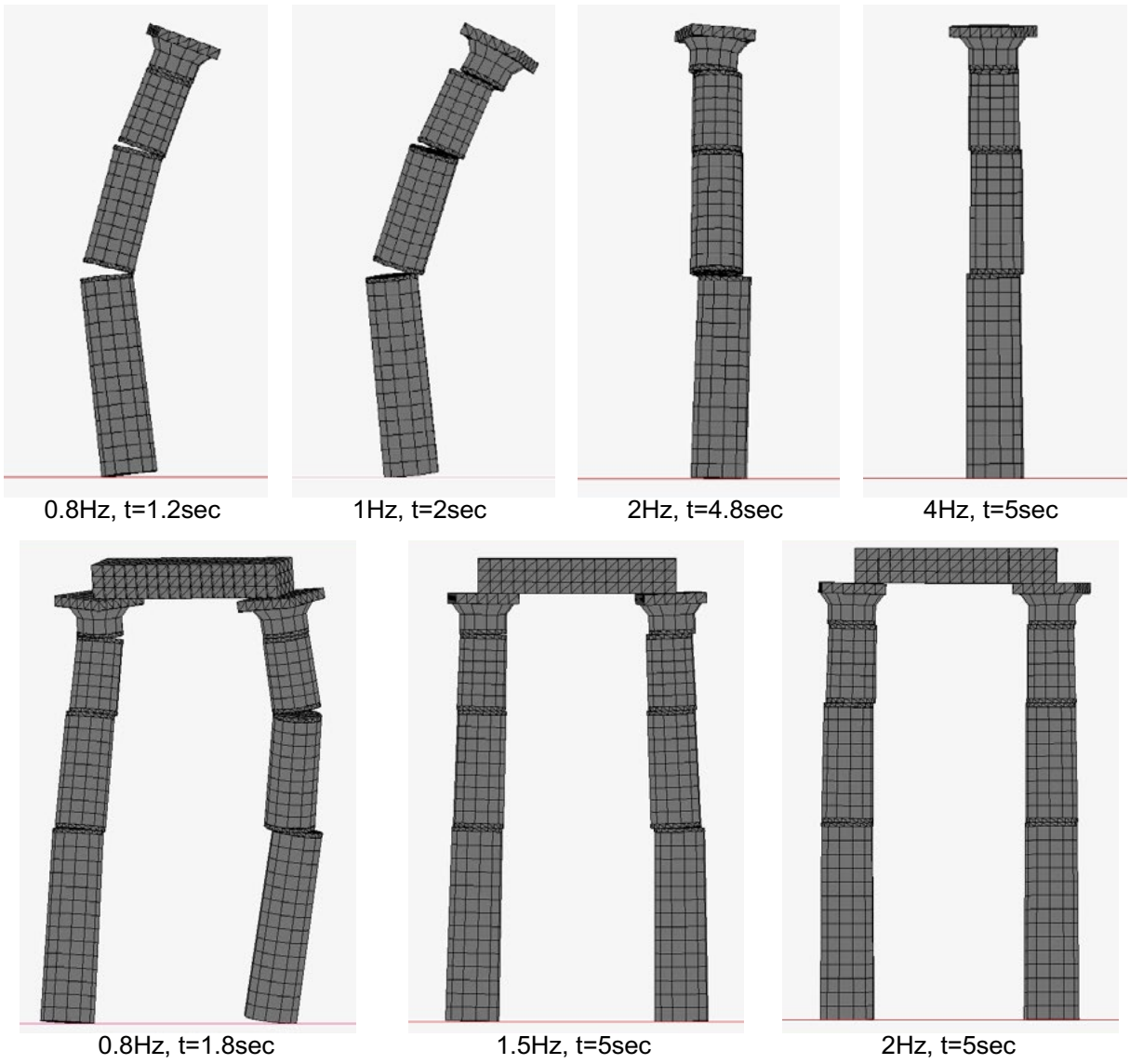
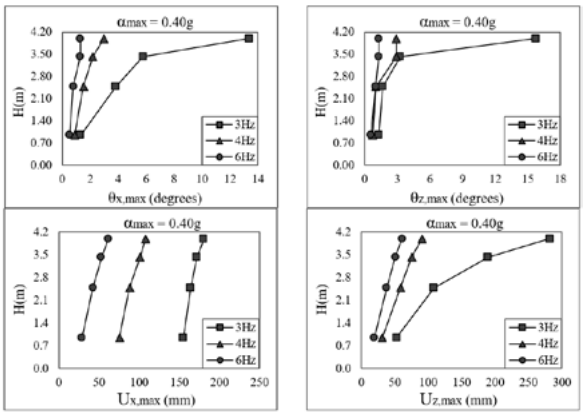


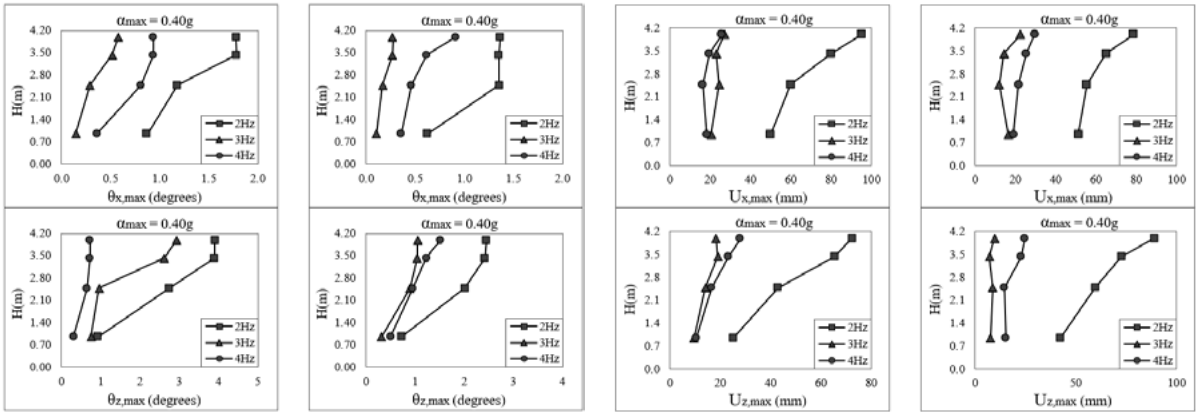
Fig. 2. Dynamic response images of the standalone column and of two columns under an epistyle subjected to harmonic ground motion of amplitude 0.40g

3.2 Dynamic response of the system of two columns under a single epistyle

The decrease of the frequency of the excitation leads also in this case to a significant out-of-plane response of the drums and the epistyle. Moreover, the deformed shapes given in [fig. 2] verify that the system of the two columns with an epistyle requires higher accelerations to overturn than the corresponding standalone columns. In [fig. 3b] the in-plane and out-of-plane response of the system, in terms of distribution with height of maximum rotations θ_z, θ_x and maximum displacements U_x, U_z in both columns is presented. It is observed that the maximum displacements of the drums in both (in-plane and out-of-plane) directions decrease as the excitation frequency increases, whereas they increase as the ground acceleration takes larger values.



(a) Standalone multi-drum column



(b) System of two columns under an epistyle (left: left column, right: right column)

Fig 3. Distribution with column height of maximum rotations and maximum displacements for the standalone column and for the system of two columns under an epistyle

4. Conclusions

This paper presents a 3D numerical investigation on the dynamic response of standalone multi-drum columns and of a system of two multi-drum columns with an epistyle. The columns examined are from the Gymnasium of Ancient Messene, Greece. The analyses were conducted with the commercially available FE code MARC. The main findings of this study are summarized as follows:

- The response of the system of two multi-drum columns with an epistyle exhibits similarities with the response of standalone multi-drum columns. More specifically, for excitations with low frequencies, the rocking behavior of the drums is predominant. At higher frequencies, the response of both models contains sliding and rocking phenomena, whereas at high frequencies only sliding behavior is reported. Moreover, excitations with high frequencies require higher acceleration to overturn both models.
- At very low frequency motions, the out-of-plane phenomena -mainly rocking and rotation around the vertical axis- are intense in both cases. Furthermore, the conducted analyses show that the system of the two columns with an epistyle requires higher accelerations to overturn than the corresponding standalone columns with the same dimensions and the same number of drums.
- At higher frequency motions, for the cases where rocking and sliding between drums take place, the role of the epistyle to the stability of the columns is important, because it mainly prevents the out-of-plane response of the drums. Moreover, both the in-plane and out-of-plane rocking and sliding of the drums become smaller in the columns under the epistyle.
- The system of the two multi-drum columns with a single epistyle seems to be more vulnerable under excitations with low frequencies.

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Seismic Retrofit of Masonry Structures: the Lancellotti Palace in Casalnuovo di Napoli

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Abstract

The research proposed in this article focuses on the study of Italian Built Heritage towards its preservation. The contribution given in this paper aims at deepening the theme of the relationship between conservation of architectural heritage and reduction of vulnerability both in terms of structural safety and degradation phenomena. It was fundamental to explore methodologies and restoration solutions of ancient constructions. The research carried out the importance of conjugating safety and restoration choices in the scope of sustainability and saving of Architectural Heritage.
The intervention here analysed, mitigates the invasiveness of the previous project, by proposing actable conditions that made it possible to effectively return the building to the community.

Keywords

Architectural heritage, vulnerability, restoration, structural rehabilitation, territorial integration.

1. Introduction

This article deals with the restoration of Lancellotti-Durazzo palace, located in the municipality of Casalnuovo, an ancient town near the city of Naples (Italy) (Figure 1 and 2). The building is of considerable cultural interest, being also bound and protected as historical monument. The restoration project discussed in the present work comes from the need to improve a previous project presented in 2013 by the Municipality of Casalnuovo di Napoli, called "Restoration and Functionalization of Palazzo Lancellotti di Durazzo", and it replaces it for some aspects. In 2014, the scientific advice, was entrusted to one of the Authors (L. Guerriero) who highlighted that the measures adopted to consolidate the palace, did not fit the fundamental principles of architectural restoration: minimize the intervention and maximize the conservation of the historical material; use of appropriate methodologies respectful of the original statics of the building; chemical and physical compatibility of used components for structural and especially seismic improvement [Cennamo and Di Fiore 2013]; intervention's reversibility. The accurate survey of survived historical structures (vertical partitions, vaults, slabs) allowed the mensiochronological qualification [Guerriero 2016; Angelillo et al. 2017], and the development of a significant variation for consolidation works, that in the follow became executive and was based on the structural guidelines [Calderoni et al. 2009; Calderoni et al. 2010]. The variation caused a drastic change of the intervention techniques. Indeed, it was decided to not: consolidate the vaults with carbon fiber extra dossal blankets; create new metal scaffolding on wooden slabs; sacrifice the wall's summits to build curbs of reinforced concrete.
At the time of the consultation, some invasive interventions had already been carried out, so it was possible to limit the damage but not avoid it altogether.
In the end, the intervention has been brought back to a correct ideological approach to restoration, in fact it is the evidence of an architectural conservative conception that has developed in parallel with to not alter the structural conception.

Fig 1. Casalnuovo (Na), Lancellotti Palace in the years 1985, 2007, 2013, 2022 (in clockwise sense from the top, by google Earth).

2. Motivations for the intervention

The Palace preserves its original open court plan with a C-shaped configuration and a walled courtyard that opens onto a large garden at the back where the dependance is located. The rigidity of the complex is enhanced by baroque architectural elements such as the staircase, the ornaments of the openings in the façade marked by triangular tympanums and the elegant piperno (a local grey stone) portal.
A high hallway opens into the courtyard, preceded by a vaulted vestibule that leads to the staircase. The building is composed by a high ground floor and the main floor, which combines balconies and windows decorated with stucco, and by the attic that partly preserves the ancient oval openings. The internal facade has kept its original formal aspect, very sober it is lightened on the ground floor, emptying with the three large arches of the vestibule. As a result of carelessness and the abandon of several decades, the construction, made of tuff masonry with wooden slabs and roofing, was in a state of advanced degradation with collapsed portions of slabs and roofs. In this context, the Municipality commissioned a general restoration project whose interventions were necessary in order to preserve the Palace.
Firstly, a campaign of geognostic surveys was carried out in order to define the geomechanical and stratigraphic characterization of the soil foundations, in addition to investigations aimed at determining the physical and mechanical characteristics of the load-bearing elements. As a result of the surveys conducted on the elevated structure, a significant seismic vulnerability was highlighted due to the absence of horizontal connections. Therefore, structural interventions have been identified to improve the seismic response of the building, basically consisting in the construction of the new slabs and the consolidation of vaults, arches and load-bearing masonries.

Fig 2. Casalnuovo (Na), Lancellotti Palace in the actual situation (picture from Google Earth)

3. The implemented project

The original project involved some invasive interventions respect to the real state, as a general structural consolidation by injecting cementitious mortar into the walls, as well as the renovation of the intermediate floor slabs with the aim of achieving seismic retrofitting of the building [NTC 2008]. For technical and architectural needs, the project also included the construction of a staircase inside the building with a load-bearing structure in reinforced concrete, an external staircase and a shelter, both in metal structure, and the renovation of the roof with a new load-bearing structure in laminated wood beams and the insertion of reinforced concrete curbs. In the extended paper about this experience, we will illustrate point by point the difference from the previous project (invasive restoration intervention, according to who writes) and the realized one (sustainable restoration project), but this punctual explanation cannot be done in the limited space of the extended abstract, where the importance must be over all given to the philosophy at the basis of this "intervention in the intervention". During the execution phase, the need to deal with conditions that could not be detected during the design phase is not uncommon in restoration work. In the execution phase, in fact, authors had to carry out a methodological and operational reconsideration of the design solutions, in order to optimize the conservation of the historicized material of the monument, in accordance with the principles of architectural conservation. The inspections on-site and the examination of the drawings of the executive project allowed the identification of some operative weaknesses, in relation to which some changes in works have been identified, in order to increase the conservative dimension of the intervention. In particular the implemented project provides to: maximise the preservation of historic material (such as the masonry); do reversible interventions (that can be revised over time); make increase floors stiffening; obtain final floors stiffnesses comparable to the structure's original one; maintain unaltered vertical static patterns; have significant cost reduction. Figure 3 shows some example details of putting this theory into practice. Nowadays, this ex-abandoned construction has become a centre for the promotion of men's tailoring art, being in a a production hub of worldwide importance in this field. In fact, in Casalnuovo are based some of the most prestigious men's tailors in the western world, starting from Isaia or Kiton, that born in the same period in Arzano, a few kilometers away from Casalnuovo.

Fig 3. Casalnuovo (Na), Lancellotti Palace, structural intervention details a) The ribbing of the pitched roof; b) beams reinforced with special metal curb (which don't require breaking the wall).

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Sitography
https://www.facebook.com/CasalnuovoMemories/photos/?tab=album&album_id=668002349924158

The CLT panels: a sustainable response for existing buildings

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Abstract

The Cross Laminated Timber (CLT) is a good response to the need to improve the existing structural assets. It is an innovative building material that is part of the family of "engineered woods" and can be used both for local reinforcement and for an improvement of the overall response of existing structures. Its use can be a flywheel for the rebirth of the "short" forest-wood supply chain. Several countries are pushing in this direction like Italy that is deepening the knowledge of the technological and mechanical characteristics of some local species potentially usable as chestnut wood. This approach also responds to the issue of sustainability, affecting the life cycle of the industrial ecosystem with long-term actions. The rapid technological development has not been followed by the regulatory update that is firm to glulam. This lack could stop the "short" forest-wood supply chain and even more the use of the CLT itself losing all the benefits that would bring in several areas.

Keywords

CLT, Wood, Standards, LCA (Life Cycle Assessment), Structural restoration.

1. Introduction

For some time, natural and renewable materials have assumed a key role in the construction industry. Therefore, in recent years the idea of wood as a building material has been revived (Sun et al., 2020). An "evolved" wood with improved mechanical behaviour. A clear example is the *cross laminated timber* or simply CLT, panels made up of several layers of solid wood lamellas glued to form rotated layers of 90°, respectively. Its strong success is given by the possibility of using a sustainable material both to build tall and midrise buildings and to strengthen existing structures (Frunzio et al., 2018; Frunzio & di Gennaro, 2018, 2019; Rinaldi et al., 2021). In densely populated urban areas, it is difficult to imagine the construction of new structures, but it is very necessary to improve what has already been built. The potential goals achievable with the use of CLT for the conservation of existing structures amplify the need to overcome the limits related to regulatory gaps. Unfortunately, the regulatory adjustment (Lukacs et al., 2019) did not follow the research activity (Izzi et al., 2016) and the rapid technological and constructive progress. Several authors (Brandner, 2013, 2018; Frangi et al., 2009) have contributed to the study of the physical and mechanical behavior of CLT. The gap between the expected results and the experimental ones is increasingly frequent, in safety disadvantage. Therefore, the current standards are not enough to describe the behaviour of this new material. The update of regulations is becoming increasingly mandatory.
This paper focuses on the reference standards currently used at European and international level.

2. Diffusion of CLT in the global market

Cross Laminated Timber (CLT) was born in Austria and quickly appreciated throughout Europe. Although among the many known woods, only a few are valid for trade and even less for structural uses. It all starts with timber selection, defect removal, and material classification.

Fig. 1 CLT panel: example of installation.

For example, UNI EN 14081-1:2019 specifies the requirements for visual and machine classification. The classification is followed by the cut and all other processes that lead to the finished product.
In the specific case, CLT is an innovative building material part of the "engineered wood" family: it consists of laminated wood arranged in cross layers, typically in odd numbers, and glued under pressure to form a single wooden element with exceptional load capacities in all directions. To the excellent performances in case of seismic events should be added the fast production rate, the accuracy in the cost prediction phase, as well as the effectiveness of energy performance, and the lower environmental impact compared to other building materials. Most CLT panels are made for a specific application with prescribed dimensions, shape and appearance [Fig.1], and can be used as a noble alternative to reinforced concrete to build walls, roofs, floors, and ceilings. Precise fabrication is often based on Building Information Modeling (BIM) and other prefabrication technologies.
In projects with CLT, laying on site does not last more than a few days. It is a fast dry construction process, with very little waste production.
The above-described characteristics, allow the CLT to be appreciated in several countries such as Canada, Japan, America, and New Zealand. For example, the new Kaikoura District Council Building and the Kenton Site Development in Christchurch were planned as CLT application (Iqbal, 2015). However, the use of this technology is limited because, like all construction products, is necessary a qualification process, for which, however, there are no well-defined standard.

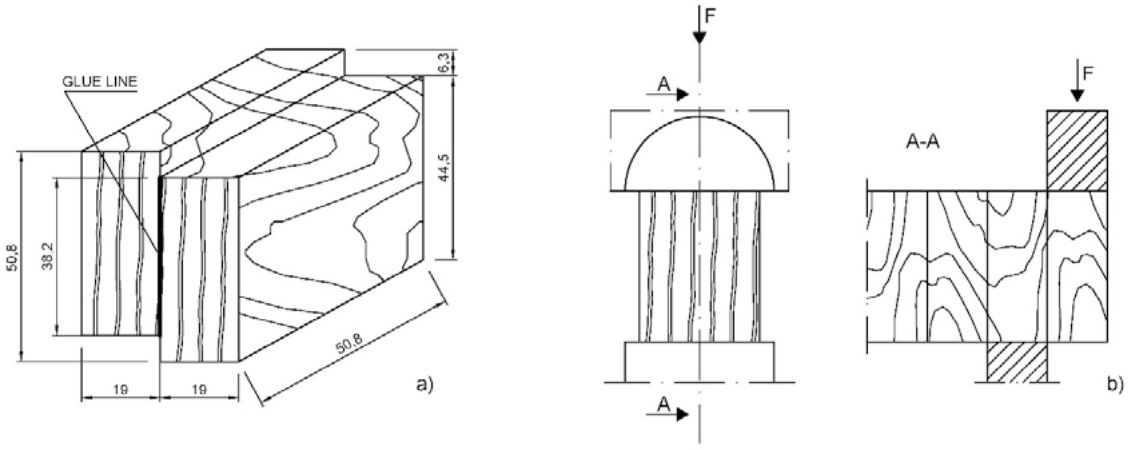

Fig. 2. a) Shear test specimen (ASTM D905–98); b) Shear test scheme (UNI EN 392:1997).

When used it is "assimilated" to laminated wood indeed even though several authors have demonstrated that the gap between the expected and the experimental result is significant, this in safety disadvantage. To determine the behaviour of the bonding surfaces of CLT panels, in the absence of specific technical regulations, any Authors have carried out several tests according to the standard UNI EN 392:1997 (Frunzio et al., 2021) [Fig.2, b)]. Since this standard was developed for laminated wood, no indication about the orientation of the fibres with respect to the application of the load is provided. This aspect greatly affects the resistance. Several studies have demonstrated indeed that is evident how the orientation of the individual layers takes on considerable importance both in terms of resistance and in terms of "quality" of breakage.

It should be made clear that a further difficulty arises even where the qualification rules of a material are excessively specific and binding. The resulting economic expenditure would make it impossible to choose new products at the expense of technological evolution. A clear example is provided by Goto (Goto et al., 2018). The paper explains how, in Japan, the process of qualifying new connectors for wooden structures (JIS B 1112-1995) is so expensive that it is necessary to use only those already standardized.

Apparently, the situation is different in America. Yeh formally describes the development of the ANSI/APA PRG 320 (Yeh et al., 2012). This standard was born as an agreement protocol to encourage the economic exchanges between the Canadian and the American market. It indicates the procedure to be followed for the accreditation of CLT panels (The Engineered Wood Association, 2020). Even if in paragraph 8.2.5*,* footnote 24 quotes verbatim: *The ASTM D905 [Fig.2.a] shear block test is intended for [..] layers parallel to each other and with the grain oriented in the same direction, such as glulam*. [..]

Regardless of the geographical area of use, the CLT brings with it such regulatory limitations. which are basically fixed to laminated wood.

3. The advantages of CLT with local essences

The regulatory limits do not stop the need for the use of a sustainable material for local reinforcement and/or for an improvement of the overall response of existing structures. This requirement is also part of the 2030 Agenda goals: It is necessary to improve the sustainability of the structure making them more efficient from the resources consumption point of view and improving the use of green technologies. The use of CLT panels can be a driving force for the rebirth of the forest-wood supply chain as it is expected for Japan (Goto et al., 2018). Italy is also moving in this direction deepening the knowledge of the technological and mechanical characteristics of some local wooden species potentially usable: as beech, eucalyptus, chestnut. This approach also responds to the question of sustainability as one of the multiform responses to the pandemic. In this sense, in fact, the idea of a new Bauhaus movement to rebuild a post-COVID-19 Europe was born. One of the goals is: *The need to think about the long-term life cycle in the industrial ecosystem.* The use of local essences well meets this objective. The reinvigoration of the "short" forest-wood chain would ensure the adoption of clean and environmentally friendly technologies.

Wood, by its nature, stores carbon dioxide and releases oxygen. Only at his death, in the decomposition phase, releases the stored carbonic anhydrite. Naturally, forest life frees and maintains CO2 in balance. Targeted action in favour of such activity can greatly improve life on earth with long-term effects. With the management of local forests, and therefore with the controlled felling of shrubs, forest life is encouraged. The cut wood can be used to produce CLT and not only. Production waste, in turn, can be used to produce heat (pellets and firewood). It should be noted that wood products, CLT and others, would continue to store CO2 and only at the end of their useful life, disposed of producing heat, would go to release it. In this way there are more live shrubs that act as storage for CO2 and storage would also be present in new or reinforced structures. To the amount of CO2 stored must be added the share that is saved by choosing wood rather than another building material such as steel or concrete. We must add all the share of emissions that are saved with the sharp reduction in transport that would be necessary in supplying raw material when it is not present in the territory of production, moreover.

4. Conclusion

The possibility of using wood, and in particular the use of species belonging in the destination territories allows favoring the "short" forest-wood supply chain. In this way, the redevelopment of the existing structural heritage with the use of "local" CLT would allow to:

- improve scientific and technological knowledge;
- positively amplify economic development;
- strongly reduce CO2 emissions;
- promote the achievement of the goals set by the 2030 Agenda, in particular:
    - promote sustainable development, consumption, and production (also shared by the new Bauhaus movement: the need for long-term thinking and life cycle in the industrial ecosystem).
    - improve life on earth;
    - encourage the development of environmentally friendly technologies;
    - strongly leave for inclusive and sustainable industrialization.

The widening of the knowledge about the mechanical behaviour of the CLT and the following regulatory update mostly focusing on the use of local essences, is necessary. This could improve the mechanical behaviour of the structures preserving at the same time the existing structural heritage.

The speed of installation must be strongly highlighted, moreover. The realization of the works projected with the CLT panels lasts very few days since they are realized for specific applications with prescribed dimensions, shape and aspect. In highly urbanized areas, this aspect significantly reduces inconvenience due to the interactions with the surrounding environment improving safety aspects and in general the quality of life.

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Conservation state and structural issues of existing infrastructures: the case of statal road bridges in Campania

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Abstract

The present paper deals with new management policies adopted for the smart handling of the statal road bridge asset in the Campania region, Italy. The research group of the University of Campania "Luigi Vanvitelli", as member of the FABRE consortium, provided a scientific support to the handling body for applying to a number of current bridges the multi-level approach proposed in the recently enacted Italian "Guidelines for classifying and managing the risk, assessing the safety and monitoring existing bridges". In the present study, the main outcomes obtained in the first phase of this activity are presented with reference to about 20 bridges. Hence, a characterization of the entire sample of interest (80 bridges) is firstly proposed and then the preliminary outcome obtained during the visual surveys are presented and discussed. The main causes of deterioration and damage phenomena, as well as the general conservation state of existing bridges, can be identified based on the presented results.

Keywords

Existing road bridges, Management policies, Italian Guidelines, Conservation state, Structural issues, Structural vulnerability

1. Introduction

The bridge collapses occurred recently all over the world, and in Italy, highlighted as the road bridge asset is generally in severe conditions for two main reasons: i. the ancientness of existing bridges; ii. the lack of maintaining interventions performed on existing structures. In fact, in the second half of the last century, there has been a strong strengthening of the road networks in conjunction with the economic development. Thus, a significant portion of the entire road infrastructural asset consists of reinforced concrete bridges realized during those decades and, with a certain probability, many of them overcame their service life, which could be approximatively estimated at 50 years (Dias, 2013), (Schiessl, 1996), (Mele & Siviero, 1991). Given the huge number of infrastructures which are present in the Italian peninsula, it is evident the need and the convenience of facing the problem at different detail levels: from a territorial approach aimed at identifying the riskiest structures to a single scale for reducing the structural vulnerability of bridges affected by significant structural issues (De Matteis, Bencivenga, & Zizi, 2022).

The "Italian Guidelines for classifying and managing the risk, assessing the safety and monitoring existing bridges", which have been recently enacted (Ministry of infrastructures and Transports, 2020), give a possible solution, proposing the adoption of a multi-level approach. Such a methodology consists of assessing a so-called "Attention Class", according to which different measures have to be implemented (e.g. accurate safety assessment, monitoring activities, special inspections, etc.) and that is based on sub-classes related to different sources of risk: structural, seismic, geotechnical (landslide) and hydraulic. Many administrative bodies started to apply these guidelines for their own bridge asset. FABRE, which is a consortium including a number of Italian universities and research institutions, mainly focused on the problem related to the safety of existing bridges, provides support to these organizations.

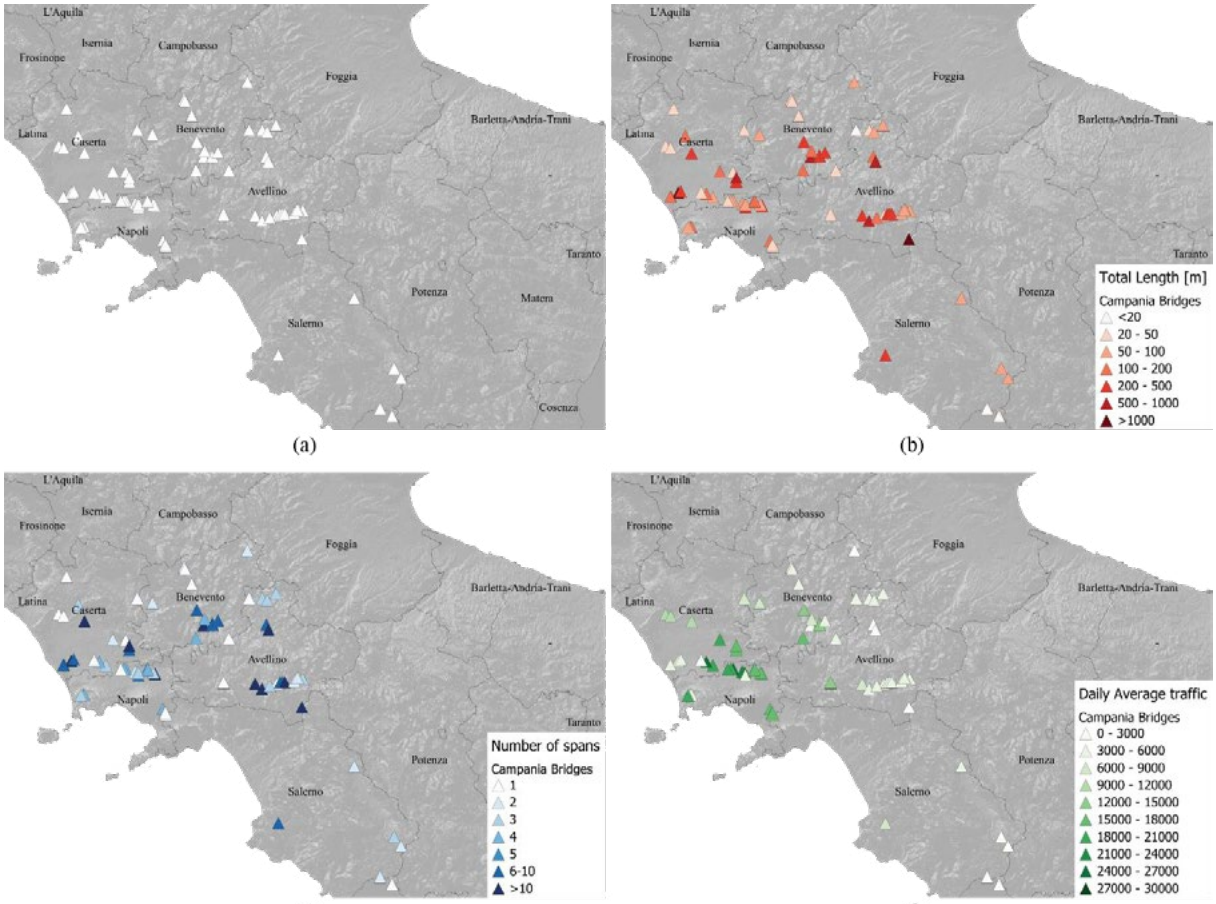

Fig 1. Census of considered bridges: (a) geo-localization, (b) total length, (c) nnumber of spans annd (d) daily average traffic.

The present study reports the activities performed by the research group of the University of Campania "Luigi Vanvitelli" in collaboration with the statal handling body. In particular, the preliminary outcome obtained from the application of such a methodology on a sample of 80 existing statal road bridges in the Campania region, Italy, are presented, focusing on a preliminary census of the structures and then showing the first outcomes of visual inspections.

2. Bridge census and characterization of the sample

The first phase of the study included a reconnaissance of the bridges based on the available data provided by the administrative body, which were further enriched by means of open-source software that guaranties satellite or virtual views (e.g. Google Earth and Maps). Thanks to this preliminary procedure, all the bridges were geo-localized and some information related to typological characteristics of the structures (e.g. number of span, static scheme, total length, presence of nearby waterways, etc.) identified.
A geo-localization of the bridges concerning this study, together with some of the collected information (i.e. number of spans, total length and daily average traffic) are shown in Fig. 1.
Based on the preliminary characterization of the sample, it has been noted that:

- A significant portion of the bridges under investigation (about 50%) has a total length lower than 50 m;
- A large portion of bridges (about two thirds) present a number of spans lower than or equal to 4;
- The most recurrent typology is the simply supported deck in reinforced concrete or prestressed reinforced concrete;

Fig 2. Example of significant defects: (a) deterioration of the Gerber support, (b) damage of supporting pad and (c) impact damage on prestressed reinforced concrete beam.

- Many of the structures of interest are distinguished by ordinary traffic level, being only two the cases with a daily average traffic higher than 25000 vehicles.

The collection of these data was the first step of the entire process since it allowed for programming visual inspections necessary for developing the succeeding phase of the activity. In particular, based on these data, it was possible to identify the presence of interferences with other transport ways (e.g. railway, highway, other road, etc.), the necessity to perform the inspection with supporting tools (e.g. bridge inspection vehicle, mobile staircase, etc.) and the presence of vegetation to be removed. Moreover, preliminary visits aimed at confirming the collected data were carried out, which allowed to definitively plan visual inspections. In the following section, some of the main outcome arisen from the first visual inspections are shown.

3. Main outcomes arisen from visual inspections

To date, about 20 bridges have been inspected. All inspected bridges were made in reinforced concrete or prestressed reinforced concrete. The visual inspections entail compiling specific forms aimed at cataloguing the presence of defects for each structural element. Generally, it has been observed that the conservation state of the inspected structures is heterogeneous. Among the most alarming situations, it must be mentioned the case represented in Figure 2a. The reinforced concrete bridge under consideration is characterized by a typical Gerber-Niagara static scheme, which consists of a beam simply supported by two cantilever portions of continuous lateral beams by means of Gerber supports. These types of deck discontinuity could represent a severe structural problem for existing bridges since adequate joints at the road level are usually absent and thus the water percolation could provoke a significant deterioration of the concrete, as well as corrosion of reinforcement steel bars. Moreover, under the structural point of view, high shear forces can occur in correspondence of Gerber supports. Thus, according to the Guidelines' procedure, they are considered as critical elements, and in case of structural problems acting on them, an accurate safety assessment of the entire structure must be performed.
With reference to support systems, in some cases deteriorated supporting pads have been surveyed. An example of this phenomenon is provided in Fig. 2b, where the precarious stability of the metallic support device can be noticed.
Another significant structural problem is represented by impact damage due to vehicles transiting under the structure. In the case of Fig 2c, the impact caused the rupture of prestressing tendons in the lateral beam of the deck.

Fig 3. Typical conservation state of inspected prestressed reinforced concrete bridges.

Another significant structural problem is represented by impact damage due to vehicles transiting under the structure. In the case of Fig 2c, the impact caused the rupture of prestressing tendons in the lateral beam of the deck.
Regardless of these critical situations, conservation states compatible with the ages of the constructions have been surveyed in many cases. It has been generally observed that the degrade phenomena is worse in reinforced concrete bridges rather than in prestressed reinforced concrete bridges. This could be related to the construction process, since usually prestressed elements were pre-cast, while the ordinary reinforced concrete was generally cast-in-situ at the expenses of quality and thus durability of the material. On the other hand, prestressed reinforced concrete bridges can, in some cases, be affected by corrosion phenomena of tendons, which are not visually inspectable, and thus require additional special survey methodologies. Some pictures of ordinary degradation phenomena in prestressed reinforced concrete bridges are shown in Fig. 3.

4. Conclusions

In this paper, the ongoing activities carried out by the research unit of the FABRE consortium University of Campania “Luigi Vanvitelli”, have been presented with reference to statal road bridges.
In general, it has been highlighted the importance to perform an accurate census activity to effectively program visual inspections. On the other hand, the performed preliminary visual inspections showed the presence of some recurrent critical situations, which could need immediate interventions to preserve the safety of the road users. According to the outcomes obtained by in-situ inspections, the following main conclusions have been drawn:

- prestressed reinforced concrete bridges generally present a state of conservations that is better than ordinary reinforced concrete bridges, despite in the former there is a significant uncertainty due to the difficulty to inspect the state of prestressed tendons;
- ordinary reinforced concrete bridges realized in the second half of the last century in some cases are affected by a significant deterioration state, mainly due to lack of maintenance;
- water conveying systems on the bridges often are not functioning properly, provoking significant structural problems, such as corrosion of reinforcement bars and detachment of external concrete covering.

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Use of structural steel in cultural heritage and for the strengthening of existing structures

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Abstract

The scope of this paper is to present two case-studies regarding the use of structural steel in cultural heritage and for the strengthening of existing structures. First, the case of the steel canopy that now covers the gymnasium stoas at ancient Messene is presented. The steel structure was designed to be in complete harmony with the ancient monument. Due to the close proximity of the new structural members with the monument, a special procedure was followed, that included a 3D scanning of the monument, the transfer of the cloud point to drafting software and the completion of the design with great accuracy. In the second example, structural steel is used for the strengthening of a masonry building in Athens.

Keywords

Structural steel, strengthening of existing structures

1. Introduction

Structural steel is used nowadays for numerous applications, ranging from low end to high end structures. Despite the progress that has happened in the last 30 years in the field of building materials (high strength cementitious materials, fibre-reinforced plastics, etc), there exist fields in which structural steel dominates the market. In the case of cultural heritage structures, steel has a significant advantage, which is the reversibility of the structural interventions. Similarly, in the case of strengthening of existing masonry structures, steel presents a number of advantages, as e.g. high strength and stiffness. Moreover, steel can be used for the design of the temporary structures that support masonry walls during the construction period and gives the potential to study alternative solutions that optimize both the final structure, as well as the erection methodology. This paper presents two case studies that highlight the use of structural steel in cultural heritage and in the case of the strengthening of a century old masonry building in Athens.

2. Steel canopy of the gymnasium stoas at ancient Messene

Ancient Messene constitutes an impressive example of Hellenistic city in Greece. It has been recently excavated and restored, as most of its material has been revealed fallen and abandoned at the flow of the stream. Its Gymnasium (Fig. 1) consists of the stadium and long stoas that run all along its three sides, while at the fourth side a monumental honorary building is constructed. It is situated at the south of the agora, in a natural formation of slopes that create the appropriate background for the construction of its large stadium.

The aim here is to present the study of a canopy that partially covers the NE corner of the Gymnasium's stoas. Their colonnades have been recently restored using mainly the ancient architectural members. The canopy is set at a length of 31.00m for the Eastern Stoa and almost 12.00m for the northern one and covers an area of almost 400m^2. The shed is designed with reference to the ancient model of the wooden roof. The loads from the roof end up on the ground with columns placed alongside the ancient bearing components (colonnade and back wall) so that the new structure will leave the monument completely unaffected. With this arrangement of new columns, the ancient building remains without

Fig 1. Messene: a view of the monument, after the intervention, where the steel columns and members are hidden behind the ancient columns and lintels

aesthetic charge from new elements especially from the outside (Fig 1). This design takes also care for the back walls of stoas. This is achieved by the arrangement of back columns behind the monument in the ancient ditch and the suspension of the restoration of back walls by the shed. In that way, the archaeological relic remains untouched from the metal canopy and also the walls are restored in a modern way so as to create the dark background for the admiration of the well lighten by the sun colonnades. The design of the roof offers also great flexibility for future interventions, such as anastylosis of other architectural members, conservation of the stone entablature or the back walls, etc. In the visible parts of the shelter there are no elements that would remind modern constructions. The dimensions of the new columns are decided to be thinner than those of the ancient material to be hidden behind them. The concept is to remain invisible to the visitor, when strolling around the stadium. The back wall is recreated by plasterboards to hide the columns of the back and complete the inner space of the stoas.

Prior to the design of the steel structure, a 3D topographical scanning of the monument took place. In order to capture in 3D, the wider area of the stoa, 28 scan positions were selected and equal scans were performed. For the registration of the 28 scans, spherical targets were deployed at the area. The registration process took place using specialized software. First, the spherical targets were automatically identified for each scan. Then, using the target-based registration process, the software automatically indicated the matching spherical targets between adjacent scans and finally the scans were registered together to form a unified point-cloud, product of the 28 scans combined. The resulted accuracy of this process was 3mm to 6mm (best and worst RMS among all scans). Then, ICP algorithm was used for cloud-to-cloud registration of the scans, using as initial guess the target-based registration results. The resulted accuracy of this process was 1.9mm to 4.1mm which is satisfactory for the scope of this survey. Finally, the unified point-cloud was exported to .POD file format and also to. PTX in order to continue working on third party software. The .POD files were imported to Bentley Point-Tools application to create ortho-images of facades, sections and floorplans with scale information embedded into them. Therefore, the architect's team could easily import those ortho-images into CAD and draw as build plans of the stoa. The structure was designed against combined wind and snow loads. Special attention was

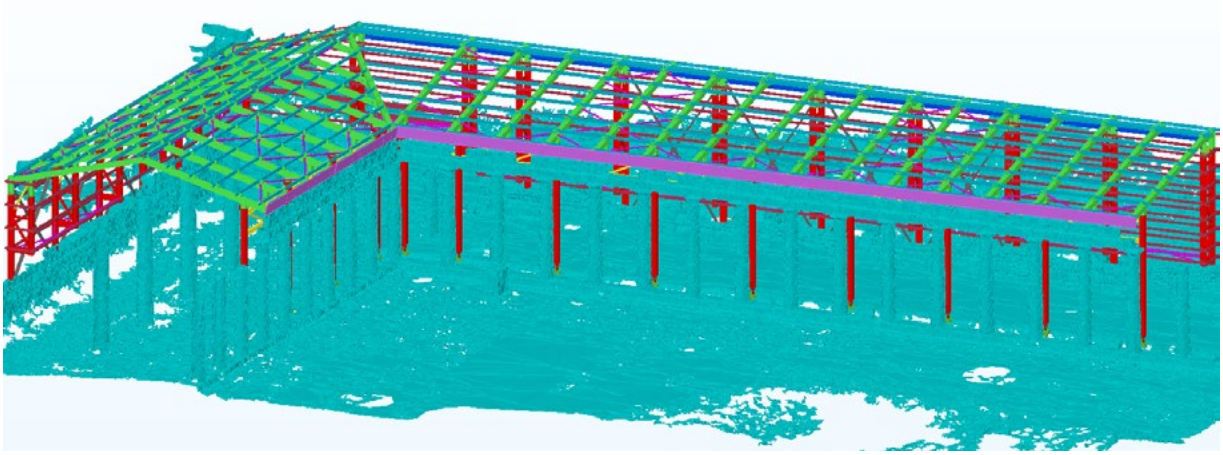

Fig 2. An overview of the steel structure having as reference the digital model of the monument.

given to the wind loading, due to the special form of the canopy which is partially open. The aerodynamic coefficients were calculated for 4 different wind directions, following the rules of Eurocode 1-part 1-4 (2005) for open monopitch canopies, which resulted to 20 different wind load cases. The snow loading was calculated using Eurocode 3-part 1-3 (2003). In order to cover the normative requirements, a total of 61 combinations of wind and snow loads were considered. The seismic design was done according to the provisions of the Greek seismic code EAK2000. The structural steel members were designed using Eurocode 3 (2005). The analysis model was setup on the basis of the ortho-images that resulted from the 3D monument scanning. In the sequel, the structural members were inserted in the TEKLA modelling software (Fig 2). In the same model, the digital information that resulted from the 3D monument scanning was used as a reference. The detailing of the steel members followed, and the final steel model was checked for clashes with the monument, taking into account the expected displacements under the various actions.

3. Reconstruction of a listed building, keeping the masonry shell, using structural steel

This section presents the methodology followed for the design of the reconstruction of an old existing building using structural steel (Fig 3). The existing building is arranged in five floors and has a structural system consisting of masonry walls and steel beams that support the final floors. According to the architectural study of the new building, the perimetric masonry walls must be retained and the internal of the building should be demolished and substituted by a structure consisting of structural steel columns and beams and composite floors. The retention of the perimetric masonry walls posed significant problems both in the design phase and in the development of the construction methodology. Alternative solutions were investigated, in which the walls were partially or fully connected to the new structure. After judging the advantages and disadvantages of each approach, it was finally decided to realize a full connection between the perimetric masonry walls and the new structure. To this end, the floors of the structure were monolithically connected to the masonry walls, which were strengthened by means of a thin layer of shotcrete. The design of the structure was based on an appropriate model that included all the structural elements. In order to approximate the complex seismic behavior of the building, nonlinear analysis was employed, that considered the actual strength and stiffness of the reinforced masonry walls. The erection was realized after a partial demolition of the existing internal masonry walls and the utilization of certain sub-frames of the new steel structures for the temporary bracing of the perimetric masonry walls. At the upper end of the masonry walls, a strong concrete beam was arranged which was connected to horizontal steel bracing elements, to form a week temporary horizontal diaphragm. The seismic design and verification of the structure was done following the methodology included in Eurocode 8 (2004).

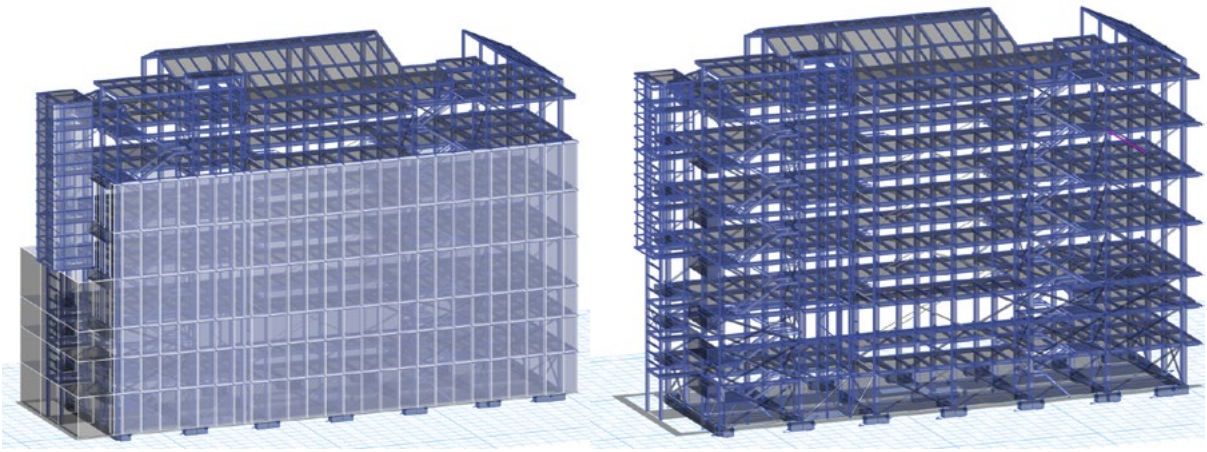

Fig 3. The three-dimensional structural analysis model of the building with (left) and without (right) the masonry walls.

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Eurocode 3: Design of steel structures - Part 1-1 (2005): *General rules and rules for buildings*, European Committee for Standardization.

Eurocode 8: Design of structures for earthquake resistance- Part 1 (2004): General rules, seismic actions and rules for buildings, European Committee for Standardization.

07 Occupants and their interaction with the built environment related to Multisensorial and Indoor Environmental Quality

Inclusive design and the multisensory interactions in public spaces for well-being of visually impaired people

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Abstract

Nowadays, Inclusive Design (ID) is considered a fundamental and innovative strategy to design spaces open to people diversity and needs. It emphasises the contribution to understanding user diversity and including as many people as possible. However, there is still a gap between theory and practice in this discipline. Currently, broad literature emphasises the inclusion of multisensory dimensions in this design process to ensure its comprehensiveness. However, few of them are focused on the human perception of people with disabilities, particularly visual impairment people in public spaces. This contribution aims to present a brief overview on the research of such frameworks to serve as a basis for different researchers to develop an inclusive design in public spaces that ensure the movability and safety of visually impaired people.

Keywords

Inclusive design, multisensory perception, public spaces, disabilities, visually impaired people.

1. Introduction

All human beings are entitled to human dignity on equal terms. This is one of the principles that leads to an inclusive design concept which is considered the main key to guarantee human satisfaction (Silva & Almendra, 2007). In this context, many researches have confirmed that it is decisive to assess the surrounding environment through human perception. However, this assessment is very complicated, especially if it concerns people with disabilities. Therefore, recent research urges that the research project be considered as central subject in the designer's formation, as it should be developed having in mind the Inclusive Design principles.

Moreover, Broffman (2015) defines the inclusive design as a critical to promoting the more elusive qualities of personal identity and a collective sense of place. He also describes it as an approach that aims to encourage broad participation in design decisions. This was confirmed by Weisman (2009) who sees that the inclusive or universal design is a tool that provide the context and a base for environmentally healthy communities.

It must be highlighted that the inclusive design in architecture, as like as Participatory Design, Co-Design and User Centred Design, describes an approach that aims to broaden design practice to include community involvement in decision-making. According to Luck (2003), in order to reach better fit between a building and its occupants, we must include the participation of those who are directly / indirectly affected by design choices, because people who are known as the "users" are active participants in the design process. Additionally, the boundary between "designer" and "user" becomes blurred and the overlaps of the two must be combined in order to obtain an inclusive design.

Importantly, when thinking about the architectural aspect, we find that Heylighen (2008) stated that architects' disappointing utilisation of inclusive designs is due to the lack of knowledge that has the applicability required by architectural practice. He has discussed the role that architects could play in developing the knowledge needed to design sustainable and inclusive environments suitable for all.

However, the architects are not the only actors for yet another part resides at the users' side through their daily interaction with buildings and spaces.

Furthermore, Inclusive design is not an obstacle, it's a philosophy based on taking into account the individual differences of space users. It's a challenge implies the creation of environments available and usable by the largest possible number of people and gives them an equal opportunity to participate in society. Not only to reduce the barriers, but also to incorporate all in a sustainable approach with social responsibility and respect for the human rights.

The aim of this paper is to present, through key references, a short review on the connection between multisensory perception in public spaces, architecture and inclusive design, needs of marginalised categories such as visually impaired people. These connections should lead to develop in the near future applied design methodologies focused on attention to enhance the quality of life and creating more immersive, memorable multisensory experiences for all.

2. The role of multisensory perception in Inclusive Design

In recent years, architectural theory and design research studies have greatly multiplied around the need to pay attention to other sensory inputs beyond the vision and which stems primarily from scientific evidence on the multisensory nature of human perception (Driver & Spence, 2000). This perception of the surrounding environments and the external world stems from the various information that human are bombarded with throughout the day. This information also can be considered as a source of raw multisensory perception that accounts for most of human assessments of the outside world. According to Ernst & Bülthoff (2004) all these different sources of information have to be efficiently merged to form a coherent and robust percept because the key to vigorous perception is the combination and the integration of multiple sources of sensory information.

Design research as well as architectural theory refer to a visual bias that is culturally ingrained. Architectural practice has been always dominated by the eye which showing that we are visually dominant creatures, because we all mostly tend to think and imagine visually. Even if it is generally agreed that we experience the built environment with all senses, few architects bear in mind the haptic, olfactory, gustatory and auditory sense while designing (Herssens, 2011).

As Nigel Cross states, architects and other designers know, think and design in a very visual way and this is what many researchers have confirmed. Among them Spence (2020) who confirmed this by quoting Le Corbusier's statement "I exist in life only if I can see", going on to state that: "I am and I remain an impenitent visual everything is in the visual" and "one needs to see clearly in order to understand". Commenting on the current situation, we create and produce almost exclusively for one sense, the vision (Lupton et al., 2018).

Nevertheless, Lehman (2021) declares that *"The architect must act as a composer that orchestrates the space into a synchronisation for function and beauty through the senses – and how the human body engages space is of prime importance. As the human body moves, sees, smells, touches, ears and even tastes within a space – and that's what makes the architecture comes to life".* Because the task of architecture is to meet the expectations and the needs of man, it tries to go beyond the first aesthetic and practical associations of architecture, by becoming aware of the sensations generated by architectural spaces where personal sensitivity plays a major role in sensory perception. Indeed, if an environment offers a range of sensory triggers, people with different sensory capacities are able to navigate and enjoy it and are free to rely on the available sensory information.

3. The public places perception by visually impaired people

Recent statistics from the World Health Organization (2022) have shown that approximately at least 2.2 billion people have a near or distance vision impairment. The problem is becoming a matter of concern because the number of visually impaired is increasing by 2 million per decade, and studies are confirming that the number of blind people may be doubled in the future (Velázquez, 2010).

According to the existing literature on this topic, visually impaired persons face many difficulties in ensuring their full autonomy in movement in public spaces where this condition heavily impacts an individuals' autonomy (Real & Araujo, 2021). That is why this people group deserves special attention due to their different capability to perceive the external environment (Maffei et al., 2021). Cardillo et al (2018) declared that visually impaired people need assistance to triumph over daily assignments and exploring unfamiliar environments. Several advocacy organisations for blind people make worldwide efforts to improve their social inclusion and their access to the same education, social and leisure activities as people without visual impairments (Martínez-Isasi et al., 2021).

Djenaihi et al. (2021) declare that this difficulty faced by the visually impaired in wayfinding does not depend on the complexity of the building but instead on the lack of environmental landmarks, which contribute to improving the accessibility in the city for visually impaired people (Thomas, 2004). Therefore, the city, in general, cannot be considered clear and legible for all users, and this impedes the movement of the visually impaired. In line with the UN's sustainability goal 11" All cities need to provide basic services, energy, housing, and transportation for everyone" and this is what urges making human settlement inclusive, which has a significant impact on human social activities (Hillier & Hanson, 1984).

4. Conclusion

In recent decades, there is a growing interest across many fields of multisensory design and the inclusively designed buildings. According to Malnar (2017) this progress has been slow in translating the insights from the academic field of multisensory research to the world of architectural design practice. From this, future studies are invited to assess multisensory perception in a more precise and reliable way and to develop consequently methodologies and guidelines for a wider inclusive design concept taking into account more categories of people.

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Natural Ventilation Strategies in Buildings as Part of Indoor Air Quality and Healthy Environment

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Abstract

The rapidly increasing consumption of energy and natural resources in recent years affects the world on a global scale in terms of environmental, economic, and social aspects. In this case, environmentally friendly strategies should be determined for buildings that constitute a large part of the world's energy and natural resource consumption. At the same time, these strategies should have the qualities that will enable human beings to continue their lives at a healthy and comfortable level. Among these strategies, indoor air quality, human comfort in indoor environment and natural ventilation has a significant place in the context of healthy environment. The airborne transmission of the current COVID-19 epidemic has also demonstrated the importance of these three concepts for human health. This study is contained literature survey about these three concepts and process of conducting the survey and experiment are explained, and information is given about the environments where the experiment will be conducted and the CO_2 measuring device. Measurements were made in an Architecture office building in Ankara. The analyzes of the survey and preliminary results of measurement are presented. The last part of the study consists of conclusion and future work in order to develop natural ventilation strategies.

Keywords

Indoor air quality; human comfort; indoor environment; natural ventilation; airborne transmission; COVID-19.

1. Introduction

First of all, the initial idea and framework of the study is presented in this chapter. Scope of the study is explained in relation with previous research on similar subjects. Objectives are mentioned briefly. The procedure of the study is explained in the next part, and finally the future work of the study was briefly explained under disposition.

1.1 Scope of the study

Since people spend most of their time inside buildings, the air setup inside the building is important for human life. The mixing ratios of the substances that make up the air, the amount of indoor ventilation, temperature, relative humidity, air flow rate in the indoor environment are the criteria that determine the air quality. Changes in the natural mixing ratios of the substances in the air or the accumulation of natural or artificial pollutants in the air that adversely affect human health are defined as air pollution.
Indoor spaces should provide the desired conditions in terms of user comfort and human health so that people can continue their lives with comfort. Personal and environmental parameters are criteria that determine user comfort and health indoors. Ambient temperature, relative humidity, air velocity and average radiation temperature are called environmental parameters, while personal parameters are the metabolic activity level and dressing status of the person. If the indoor air is not of the desired quality, various health problems may occur in the users.

On 31 December 2019, the World Health Organization (WHO) China Country Office was informed about the cases of pneumonia of unknown etiology detected in Wuhan City, Hubei Province and WHO defined this new virus as Coronavirus disease-2019 (COVID-19). Due to the rapid increase in the number of cases globally, the epidemic was described as a pandemic by WHO on March 11, 2020 (Ghebreyesus, 2020). Coronavirus is one of the pathogens that primarily targets the human respiratory system (Rothan & Byrareddy, 2020). The indoor environment values that provide suitable conditions for human health in closed spaces due to the airborne transmission of COVID-19 have been reconsidered. There are current studies on adequate fresh air intake in indoor spaces (WHO,2021).

It is possible to increase indoor air quality without the need for additional mechanical systems by means of natural ventilation, which is one of the passive energy systems. Nowadays, it is aimed to use passive energy systems in buildings due to the tendency towards fossil energy resource consumption and to reduce the damage caused by carbon emissions to nature. With natural ventilation, indoor air quality is preserved with fresh air inlet and polluted air outlet indoors, and energy efficiency is ensured since no mechanical system is used (Santamouris,1998).

1.2 Objectives

The aim of this study, as mentioned above, is to reveal user-oriented natural ventilation strategies in buildings in the context of indoor air quality, energy efficient and healthy environment. In the context of a healthy environment, the parameters that ensure indoor air quality in indoor spaces have been revealed and natural ventilation parameters have been determined.

1.3 Conceptual framework

Firstly, a literature review was conducted on indoor air quality, user comfort in indoor spaces, human health, and natural ventilation. In these studies, indoor air quality, sources of indoor air pollution, types of pollutants that affect indoor air quality, and improvement of indoor air quality are discussed under the sub-headings. Indoor air quality has been examined in the context of user comfort and human health, personal and environmental parameters, and COVID-19 in indoor spaces, and a literature review has been made with the subtitles of natural ventilation, the basic principles of natural ventilation, factors affecting natural ventilation systems, and the effects of the building envelope on natural ventilation. Secondly, the process of conducting the survey and measurements is explained, and information is

given about the environments where the measurement will be conducted with indoor air quality measuring device. Measurements were made in an architecture office building in Ankara. The analyses of the survey and measurement results are presented. The last part of the study consists of conclusion and suggestions for natural ventilation strategies.

2. Literature review

A healthy indoor air quality can be defined as air in which the known pollutants are not present at harmful concentration levels and at least 80% of the people in this air do not feel any dissatisfaction with the quality of the air (Alptekin,2007). According to this definition, when considering indoor air quality, the components that make up the space should be considered in the context of a healthy environment. Indoor air quality must provide 3 basic conditions to provide an environment suitable for human health: thermal comfort, maintenance of normal respiratory gas concentrations, dilution, and removal of pollutants to levels below health or odour discomfort thresholds (Tatlı, 2011).

At the same time, for the users to maintain their existence in a healthy and productive way in the buildings, the environmental and personal parameters should be in the appropriate value range in indoor spaces while improving indoor air quality. Environmental parameters; thermal, visual, auditory, and indoor air quality. Factors affecting indoor quality: temperature, humidity, air movement, cleaning

(filtering), fresh air intake should be in the ideal range to provide a comfortable indoor quality (Çağlar, 2020).

Due to the airborne transmission of COVID-19, the concept of indoor air quality in indoor spaces has been reconsidered. Thereupon, the Federation of European Heating, Ventilation and Air Conditioning Associations (REHVA), founded in 1963, the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE), founded in 1959, an international professional engineering organization based in London which is CIBSE and the World Health Organization are working in order to create a healthy environment in the context of COVID-19. As a result of these studies, it has been confirmed that ventilation of the indoor environment with a correct system setup reduces the airborne transmission rate of COVID-19 (CIBSE,2021).

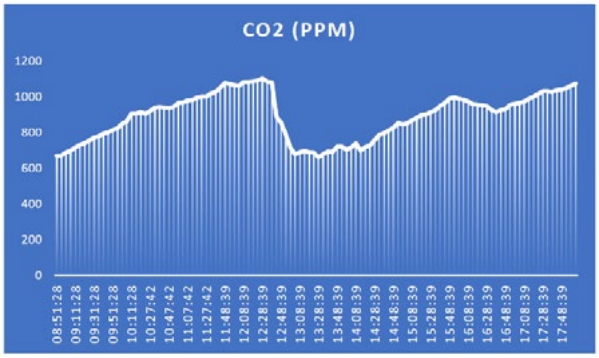
The best way to improve indoor air quality is to introduce effective ventilation strategies. Indoor ventilation is carried out with the use of mechanical systems or in line with natural principles. Keeping the indoor air quality at a comfortable level and meeting regular air exchange without the need for any energy is called natural ventilation. The main power that realizes natural ventilation is wind and thermal forces. The basic principle is to remove the pollutants in the interior environment with the openings in the building envelope (Yavaş, 2019). Mechanical ventilation, on the other hand, is the movement of air in the space by means of fans. Mechanical systems are not dependent on physical and environmental conditions. On the other hand, it is seen that energy consumption is high, maintenance and repair costs are high, and it also creates health problems for users (Uğursal, 2003).

Natural ventilation methods planning should be considered from the building design stage. Natural ventilation strategies are created with important data such as the location of the land, the orientation of the building to the land, and the climate of the region. Strategies for the building envelope should be considered after the decision to locate the building on the land is made. With the design and detail solutions of the spaces to be created on the building envelope, the clean air taken into the building is circulated within the building with the arrangements to be made in the design of the building mass. The polluted and used air is taken out of the building. In the case that the buildings that are designed considering the principles of natural ventilation, buildings with a high level of comfort for people, low energy consumption and low cost can be produced (Darçın, 2008).

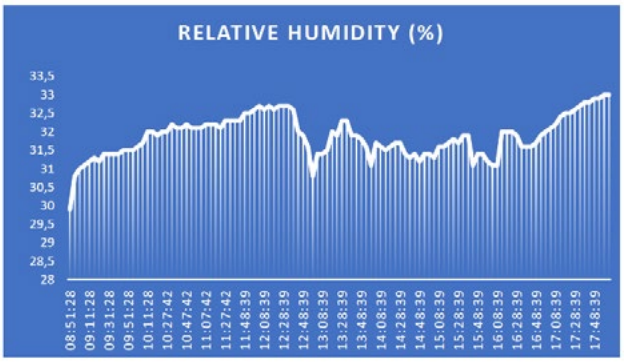
3. Survey and measurements

As mentioned in the previous part of the study, to talk about indoor air quality, user comfort and human health, data on user satisfaction and indoor air pollutants are needed. For this reason, in this part of the study, indoor air quality parameters were measured, and a survey was conducted for user satisfaction in an architecture office located in Ankara, Turkey.31 employees of the office are participated in this survey who are architects, landscape architects, interior architects, and technical draftsman. Hence, the personal parameters of the users were revealed. With the Testo 400 device, measurements made during working hours (9 am to 6 pm) in the open office, the relative humidity, temperature, CO_2 rate and air movement speed data in the environment and environmental parameters are revealed. With the start of the working hours, whereas the amount of CO_2 in the environment increases, the amount of CO_2 declines rapidly with the opening of the skylights as shown Fig 1(a), (d). As can be seen in the Fig (b), although the relative humidity decreases with the opening of the ventilation, it fluctuates over time and increases finally. As can be shown in the Fig (c), if the ambient temperature drops a little with the opening of the ventilation, it increases regularly with the closing of the ventilation. Although the graphs which is above only shows the preliminary results of 22.11.2021, the measurements have last for three months.

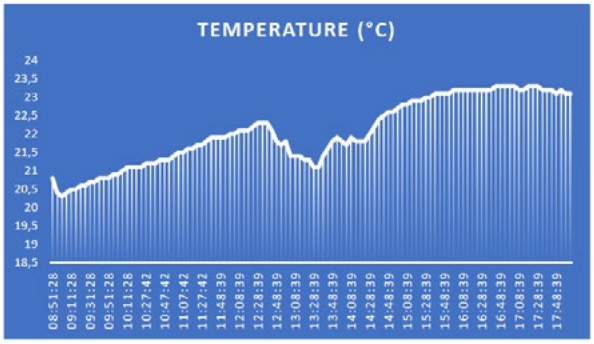
a. Rate of CO_2



b. Percentage of relative humidity



c. Temperature measurement



d. Percentage of skylight openings

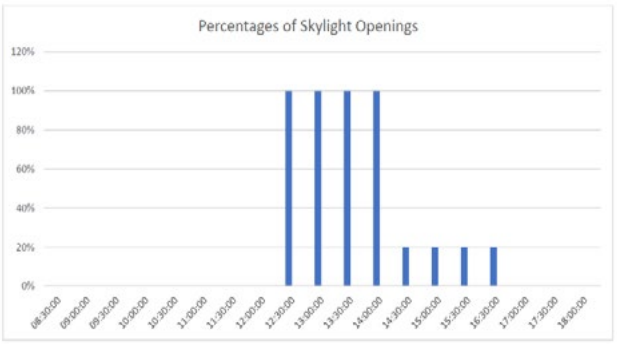


Fig 1. The graphs above are: (a) rate of CO_2, (b) percentage of relative humidity, (c) temperature measurement and (d) percentages of skylights openings graphs.

3. Conclusion and future work

As a result, to develop user-oriented natural ventilation strategies in buildings in the context of indoor air quality and healthy environment according to the method followed in the literature research, firstly the concepts related to indoor air quality, user comfort in indoor spaces, human health and natural ventilation were discussed. Then, to determine indoor air quality, user profile, comfort level, complaints, mechanical/natural ventilation habits, the application of the questionnaire provides efficient results. In addition, the indoor quality was evaluated with the relative humidity, temperature, CO_2 ratio and air movement speed measurements of the air. Future works will continue for measurements for which currently have preliminary results. MIT's CoolVent simulation which will be used in the future will be revealing the effects of natural ventilation on the comfort and energy savings of building users were. The scientific values of the indoor environment are going to be discussed with simulation studies including pollutant measurements, energy performance and air flow and thermal behaviour in the indoor environment. As the next step of the work, all these data are going to fund for producing natural ventilation strategies in indoor spaces and a practical guideline is going to be developed for designers.

Acknowledgements

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Compared spatial interpretations in the Edoardo Chiossone Museum of Oriental Art

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Abstract

The communication skills of the architecture allow the possibility to regulate the perceptual interactions between the user and the space, contributing to the definition of mental images that are generally associated with the user's visual abilities. Through the study of the explorations that took place inside the Edoardo Chiossone Museum of Oriental Art, we intend to compare the ability of people with visual disabilities and not to understand and mental reconstruct of space: a process that materializes in mental images obtained from visual and substitute perceptions attributable to multisensory theories. Understanding the most incidental aspects of this process through comparison allows us to emphasize the role of multisensoriality: a component capable of enriching exploration for everyone, expanding the concept of inclusiveness to the possibility of perception of architectural qualities by blind people.

Keywords

Inclusivity space, Blind people, Perception, Mental Image, Edoardo Chiossone Museum of Oriental Art.

1. Introduction

The following contribution intends to show the different interpretations of a museum architecture, the Edoardo Chiossone Museum of Oriental Art (Genoa, Italy), by sighted and blind people. The building analyzed, as well as being a reference for Italian museum architecture (Spesso, Porcile 2019), hides a spatial enigma, determined by a path that is not immediately recognizable.

For the development of this theme, it is necessary to understand the perceptual characteristics mediated by vision (Arnheim, 1974; Elkins, Fiorentini, 2020) and at the same time highlight the importance of multisensory perception (Pallasmaa, 2005; Spencer, 2020). This approach enriches the perceptual experience for everyone and plays a fundamental role in the field of visual impairment and inclusiveness.

The literature proposes various interaction ways between the built environment and the blind person (Devlieger et al., 2006; Meuser et al., 2019), with the main objective concerning physical accessibility, not contemplating the sensations obtained during the navigation of the architectural space. In the present study, on the other hand, we intend to use the concept of mental image which is able to express the capacity for understanding and pleasure in relating to architecture, and that foresees the influence of multisensoriality (Mallgrave, 2015), which is evident in the case study analysed.

The considerations were developed following research that is being carried out on the building through the use of questionnaires proposed during the exploration and at the end of the path which are aimed at both types of users (people with visual disabilities and not).

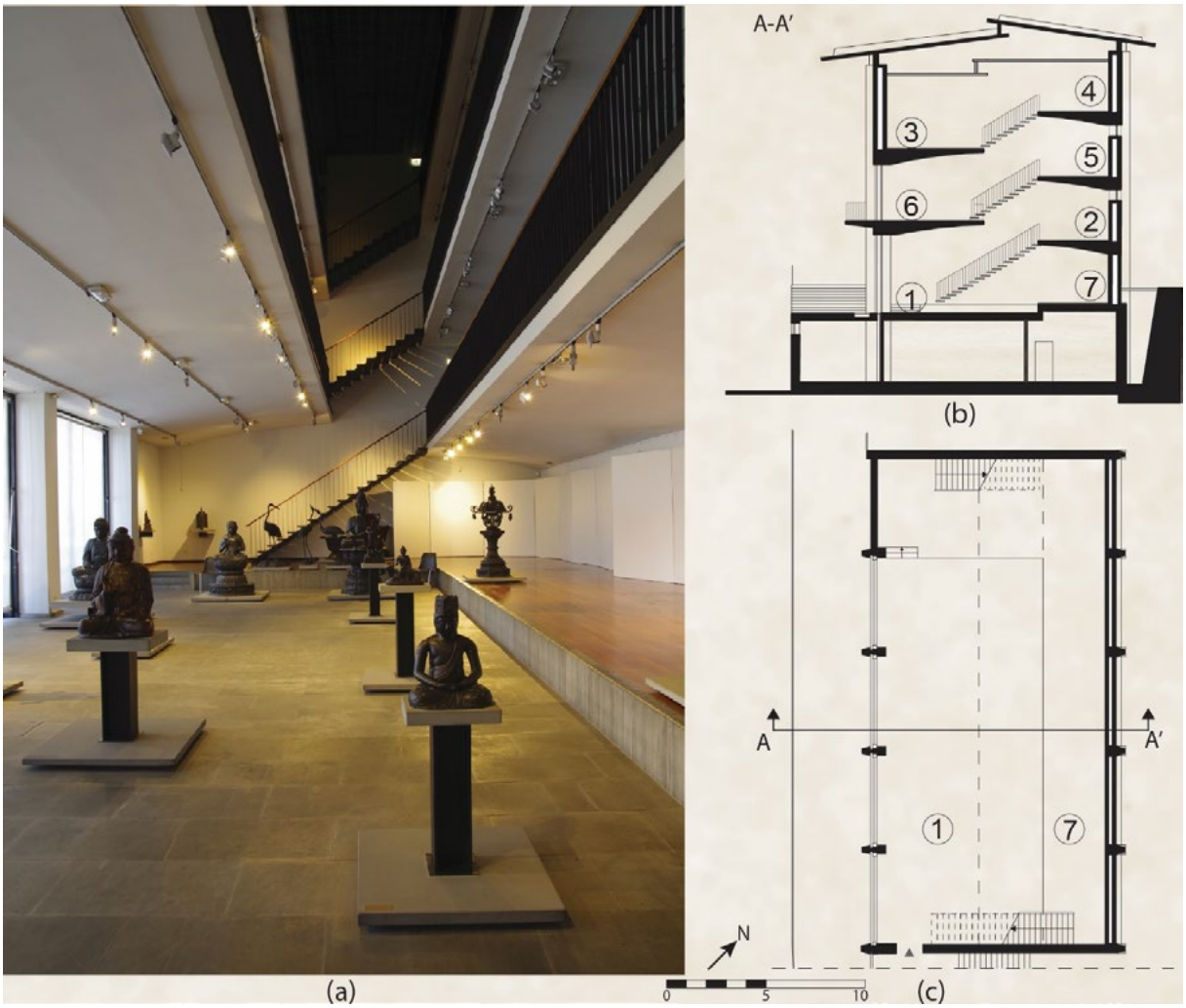

Fig 1. The Edoardo Chiossone Museum of Oriental Art (Mario Labò. Genoa, Italy, 1948-1971): a) Ground floor photo; b) Section AA'; c) Ground floor plan (by Author)

2. The Edoardo Chiossone Museum

The Edoardo Chiossone Museum of Oriental Art (Mario Labò. Genoa, Italy, 1948-1971) fits into the urban park of Villa Di Negro and houses an important collection of Japanese art (Failla, 1996). The interest to this project is also determined by its relevance in the historical context of Italian museum architecture, being the first museum built from scratch after the Second World War (Lanteri Minet, 2021). The building is small in size and has the most interesting place in the exhibition hall; the latter is composed of cantilevered floors that develop along the major sides leaving a central void at full height [Fig. 1]. The apparent formal simplicity of this space hides the complexity of the path: in fact, the connecting stairs between the floors draw a path of ascent and descent that do not coincide, in an arrangement that is difficult to understand from the ground floor and which reveals itself only during the exploration. These compositional aspects, together with the multisensory components present, are particularly suitable for illustrating the objective of this contribution.

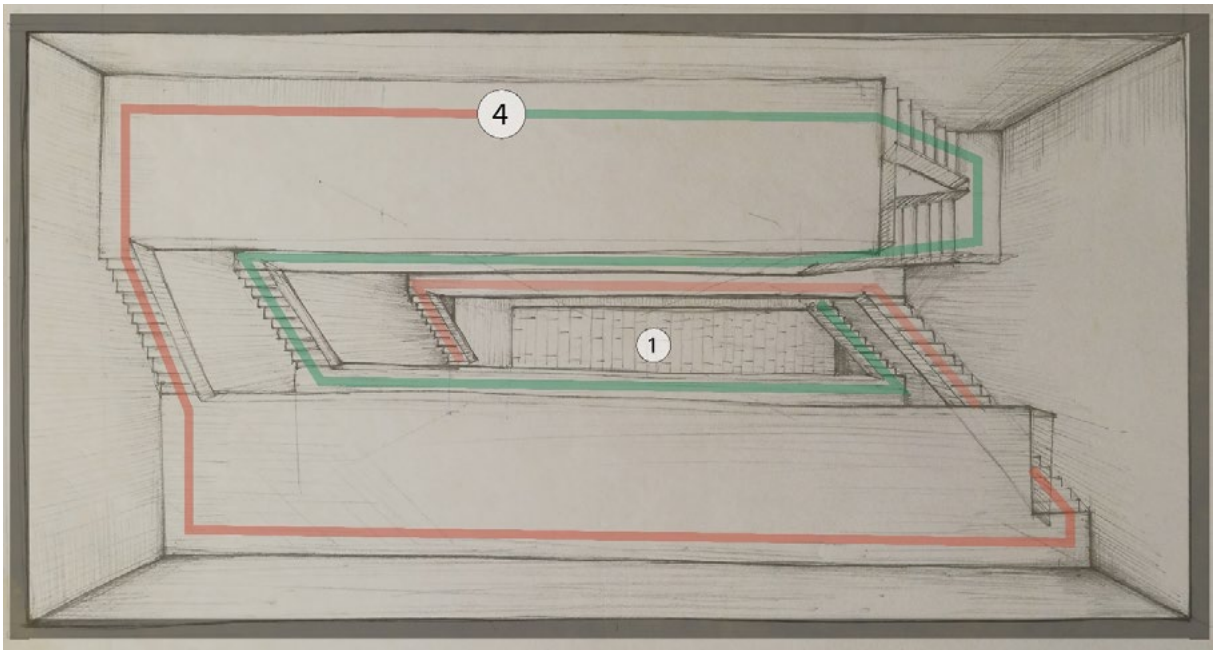

Fig 2. The museum itinerary: the ascent in red, the descent in green; a path that can be traced back to the double helix of stairs at St. Patrick's Well (Antonio da Sangallo il Giovane. Orvieto, Italy, 1527-1537) (drawing by the author)

3. Visual Suggestion

"Architecture is a constructed mental space": the statement of the Finnish architect Keijo Petäjä, reported by Juhani Pallasmaa (2011, p.17), provides for the conjugation of the experiential components with the multisensory ones. This last aspect is often placed in the background, bringing out only the visual component, because it is considered the most immediate and effective. The binomial of perception-vision is rooted in Western culture (Elkins, Fiorentini, 2020). The characteristics of the Chiossone Museum also make it possible to investigate the visual aspect and its impact for the construction of a mental model, highlighting how dynamic exploration constantly modifies the spatial prefiguration recognizable in its entirety only at the end of the path. Once you pass the access passage to the exhibition hall, the connecting stairs to the upper floors are clearly visible: a vision that is reflected in the visitor's mind with the possibility of reaching the galleries following a sequential order, determined by the alternation from one side to the other according to a vertical zigzag movement. The initial vision triggers an instant spatial recognition system that defines a mental model capable of predicting how space will develop (Casale, 2018, p. 103). This premonitory perception is denied once the first flight of stairs has been passed: in fact, walking through gallery 2, the path is recognized, understanding the non-sequential alternation of vertical connections. The final reconstruction comes unexpected as it is unusual and different from what was initially seen and imagined. The vertical movement along the stairs allows the change of point of view, which is fundamental for understanding (Holl, 2000) and thus offers views which, with the continuation of the journey, allow to identify the distinction between the two paths. This unusual spatial conformation can evoke the image of the St. Patrick’s Well in Orvieto (Antonio da Sangallo il Giovane. Orvieto, Italy, 1527-1537). The sixteenth-century double spiral staircase, in the Chiossone Museum, is transformed into a linear path that can be inscribed within a straight parallelepiped, with the two directions of movement that intertwine to meet only at the upper end of the building in correspondence with gallery number 4 [Fig. 2]. The contact point guarantees the continuity of the path and presents itself with two flights of stairs rotated
90° with compared to the others: a different spatial arrangement that makes this crucial passage even more recognizable. This analogy is relevant and effective for unequivocally describing the building, but it is an image that is still closely linked to visuality.

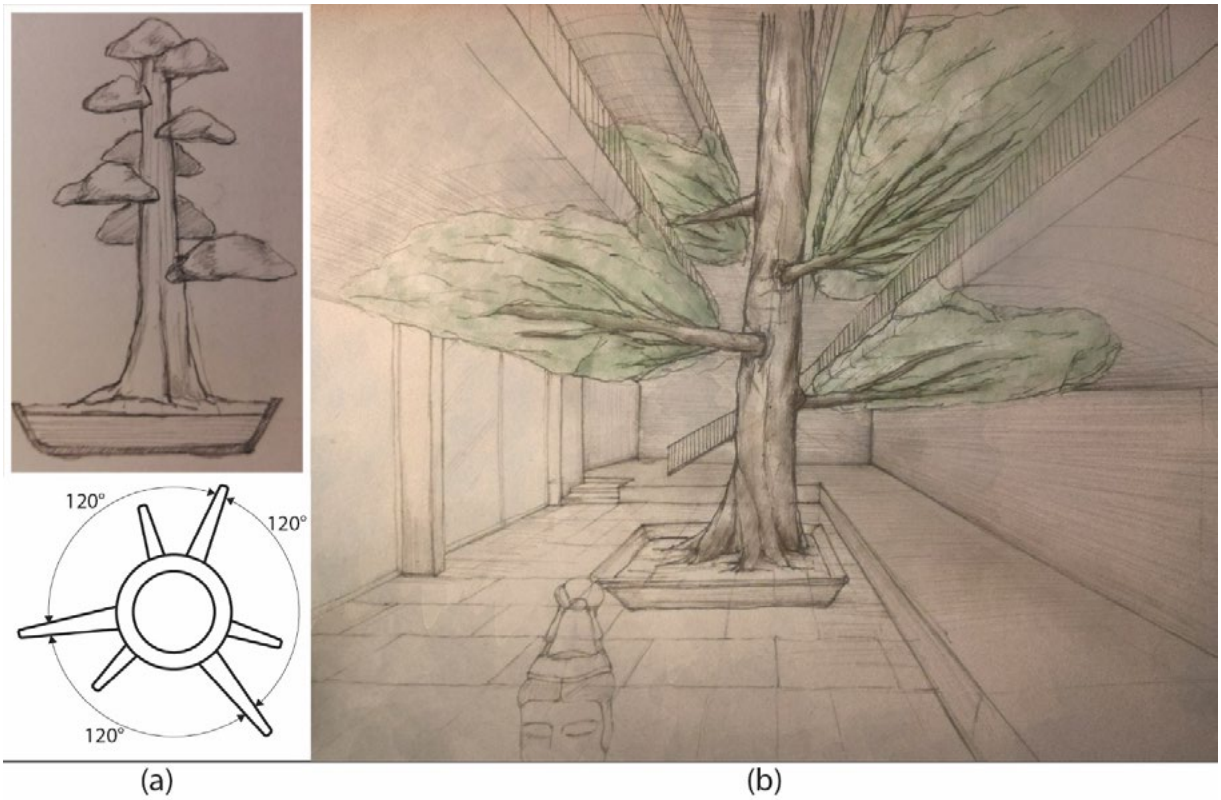

Fig 3. Museum-Nature relationship: a) Chokkan erected bonsai structure, upper bonsai front, below Plan; b) Reconstruction of a mental image by person with visual impairment (drawing by the author)

4. Multisensory suggestion

As we have said, the definition of a mental image is not identified only by the visual component but is a process determined by bodily involvement (Holl et al., 1994), as also demonstrated by neuroscience developments that have revealed the functioning of neuronal relationships within the spatial perceptual process (Mallgrave, 2015). Contributing to this process are environmental factors, often attributable to the natural world, and which the architect Peter Zumthor (2006) defines as atmospheres.
In the field of visual impairment, multisensory experience assumes great importance and it is in fact thanks the collaboration between the senses that the relationship with the environment takes place.
Touch and hearing can be considered among the most effective for architectural perception and their interaction allows us to understand space (Empler, 1997) and to obtain specific dimensional information (Càndito, 2020).
The research carried out aims to understand the most incidental aspects for the process of building a mental image of the museum. The blind person during the exploration phase activates the collaboration of all the senses, recognizing, for example, the dimensional differences between the access volume and that of the exhibition hall, in which is able to distinguish even the large empty full height space; this ability is determined by the sounds of voices or one's footsteps, which propagate and reflect with different intensity depending on the distance from the person.
Dynamic exploration allows us to highlight some determining factors for the mental image and attributable, for example, to the relationship with nature, which is revealed inside the building through the materials. The flooring of the architectural space is mainly composed of wood, which, when stepped on, emits pleasant sounds that can stimulate the imagination of the blind, thus becoming an important reference. This aspect was particularly evident during the exploration and led a visually impaired person subjected to the questionnaire to associate the museum with the structure of a type of bonsai. The well-known Japanese method of processing miniature trees (Lesniewicz, 1988) contemplates, in fact, the "Chokkan Erected" treatment characterized by a main trunk and branches alternating with each other

and arranged parallel to the ground [Fig. 3a] (Ricchiari, 2018). This metaphor can combine the main aspects of the building: the spatial structure with staggered floors and the reference to the collection hosted which is also manifested in the relationship with the neighbouring park.
This metaphorical image was drawn to illustrate in a visual form what is perceived by the person with disabilities. The interpretation proposed through the drawing materializes what is perceived inside the building, placing the tree in the centre of the exhibition hall which, with its ramifications, interacts with the architecture [Fig. 3b]. The mental image can thus find a representation that allows to evoke the synaesthetic component determined by the interpretation in the absence of vision, outlining a more engaging spatial concept.

5. Conclusion

The comparison between different kinds of users reveals meeting points and divergent aspects within the perceptual process: differences that show the more incident aspects in the two interpretations. The St. Patrick's well memory is a strictly retinal reference, which represents a well-known and immutable image. This space constitutes a reference to the distributive logic of the museum Chiossone, revealing the importance of vision to define the mental image. Another aspect concerns the interpretation of a person with visual impairment, which reveals a multisensory involvement capable of combining the compositional balance of architectural and natural forms, interpreted in a way capable of identifying all the main components that make this building special, in a deeper and more synaesthetic perception. This text highlighted the ability of people with visual disabilities to understand the space of Museum Chiossone and enjoy its qualities in analogy to a sighted person: this aspect is essential for expanding the inclusiveness of the architecture, also extending it to the perception of space qualities.

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Head Mounted Displays for lighting in Virtual Reality: Review on Measurements, Advances, and Limitations

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Abstract

Virtual reality has made a great progress over the past recent years both in recreational and professional fields. However, several factors can affect the capability of the virtual reality from the realism point of view. Luminance and colour of the stimuli could be considered as the main parameters which participate in this challenge. On the other hand, the complex way that virtual reality software such as the Unreal game engine manipulate the virtual scene before to be sent to the Head Mounted Display, can affect the desired goal. This review tries to have a general overview reached so far on the characterisation done in head mounted displays so as to evaluate the quantity and the quality of the light reaching users' eyes. Further, a discussion on the open issues in the field is provided as well.

Keywords

Head Mounted Displays (HMD), Virtual Reality, illuminance distribution, colour calibration in HMDs, colour measurement in HMDs, Colour consistency.

1. Introduction

Virtual Reality (VR), known as a novel development in computer technology, has taken part in various fields of research in which designing and evaluating of lighting has not been an exception (Fernandez-Prieto & Hagen, 2017). Among the numerous advantages that VR for lighting provides, are mainly the possibility to explore the effect of the environmental factors which influence the illumination experimental studies (Chamilothori et al., 2019; Guidolin, 2014) and providing the capability of acquiring results closer to the real world. Different aspects have to be considered to achieve the aforementioned, such as light distribution in the scene, quantity of light reaching users' eyes or colour reproduction and perception. In particular, the amount of variation in colour consistency between the real world results and experimental tests where real time rendering software such as DIALux, AGI32, Relux or Radiance fail to get satisfactory results (Araújo, 2014) should be considered. In this scenario, Head Mounted Display (HMD) can be viewed as the core for the success of virtual reality, helping the users to perceive the generated environment (Ahir et al., 2020). This implies that the analysis and measurements of the amount of light emitted by HMD, the methodology used to compare the luminous environment in virtual and physical spaces, as well as the knowledge of relation between images in the software and those shown in the HMD are essential. Current paper provides an overview of the recent methods in assessing the quantity and quality of the light emitted by HMD, also compared to those in real spaces, by using objective measurements.

2. HMD for lighting in virtual reality characterization by objective measurements

According to the literature, measurements in HMD are mainly performed to assess: 1) the light amount and distribution and 2) the colour consistency. [fig. 1] displays the methodology used for selecting the paper to consider.

2.1. Assessment of amount and distribution of emitted light

The first example of the research aimed to create virtual environments similar to the real ones from a lighting point of view is represented by (Heydarian et al., 2015). A physical single occupancy office space was used as a reference to build a 3D model and perform illuminance levels measurements for different lighting conditions. Even if the procedure used was not reported, the average level of the illuminance in the real world was used to adjust the lighting level of the 3D model presented to users through an Oculus Rift DK1.
The discrepancy between the luminance values on seven reference points in the real environment and those in the virtual model shown in an Oculus DK2 was evaluated in (Chamilothori, Wienold, and Andersen 2018). The luminance in the real space was deduced from HDR photographs taken during test sessions under real sky conditions. The same space was simulated using Radiance under clear and overcast sky conditions. Then, the luminance values in the projected virtual space were derived using the response curve of the Oculus DK2 display. Even though the real and virtual luminance values were not exactly the same, the two environments were considered comparable.
Abd-Alhamid et al. (Abd-Alhamid et al., 2019) created a test room with controlled luminance. Six high dynamic range (HDR) images were acquired, through a camera equipped with a fish-eye lens, and composed to create a 360° view of the real space to be presented through HTC-Vive headset. To ensure the accurate reproduction of real luminosity, different measurements were performed on the calibrated HDR images, in the real space and inside the HMD. Vertical illuminance and luminance values on 13 measurement points were compared with those deduced from the calibrated HDR images to ensure their consistency. The luminance values at the centre of the full field of the lens were measured using a photometer, to obtain the screen response curve. Finally, placing a chroma-meter at 10 mm from the HMD lens in a completely dark space, the illuminance values received at the eye were acquired and compared to the vertical illuminances taken in the real environment from the same viewing position.

2.2. Assessment of colour consistency

Colour, with an undeniable role in vision, could be considered as a parameter which reduces the impact of illuminance changes in the precision of vision in the scenes. This factor could be referred as colour consistency (Foster, 2011), and can be rated with a percentage between 0-100, where zero stands for the maximum and a hundred for the minimum of changes in colour by changes in illumination. The amount of colour consistency increases with the complexity of the scene and it is clearly different in the experimental tests with the values in the real world. The considerable difference in the aforementioned values highlights the fact that there are cues in the real scenes which are being used by the visual system (Gil Rodríguez et al., 2022).
The colour calibration for a HTC Vive Pro Eye HMD using two different controllers, namely PsychToolbox and Unreal Engine (UE), was followed to understand the software effects on colour reproduction of HMD (Gil Rodríguez et al., 2022). For this purpose, a room office with different objects was modelled. A spectroradiometer (as a reference instrument) and an imaging colorimeter were used to acquire the chromaticity and luminance values of different pixels in a simple and complex scene. Measurements were acquired placing the instruments in the headset close to the lens. Results underlined that Unreal Engine tone mapping operator can affect and alter the colour presented by HMD screen. In addition, subjective assessments were used to evaluate participants' colour perception under different lighting sources. Colorimeter measurements were also used to calculate the colour consistency values (CC).
In (Clausen et al., 2019) HMDs displays were characterised and validated following two approaches: measurement and simulation. During the measurement, test colours (characterised by RGB values) are displayed and the spectrum of the emitted light is measured with a spectrophotometer. During

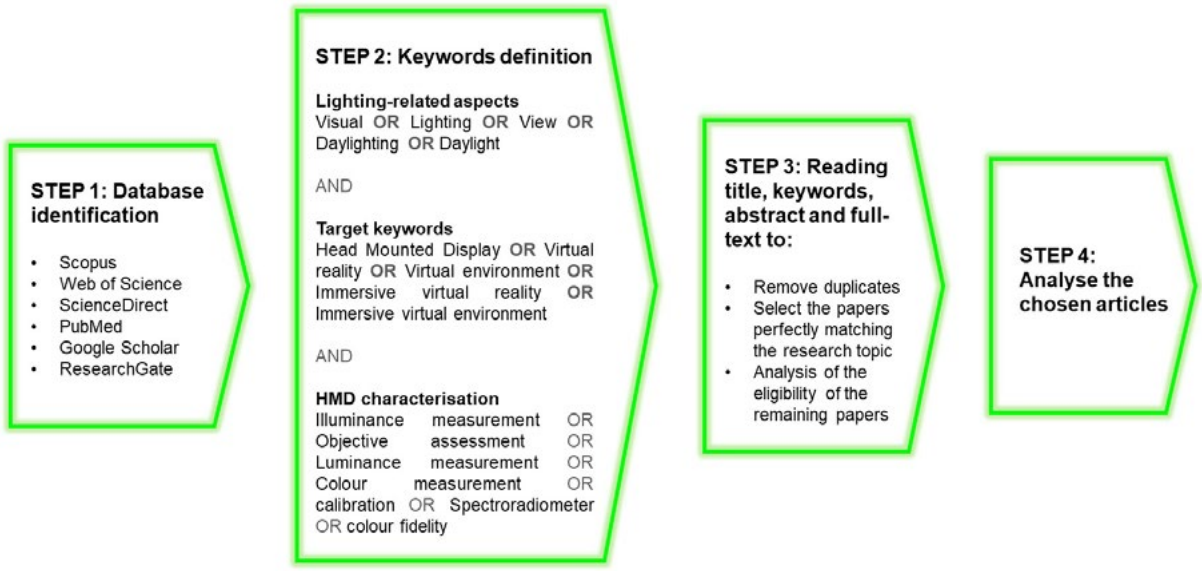

Fig 1. Methodology for the selection of the paper

simulation, the spectra of the test colours were simulated obtaining RGB values. Then, the two spectra were compared from physical and colorimetric points of view to validate the display model.
To chromatically characterize the VR device in (Díaz-Barrancas et al., 2020), spectroradiometric measurements were made with a tele-spectroradiometer aligned with the optical axis of the lenses of the HMD. The measurements over the display and lens assembly were done as a whole. The relationship between the values of the digital to analog converter of each channel and their corresponding values of luminance were analysed. The measurements were made using tele-spectroradiometer for each of the R, G and B chromatic channels independently.

3. Advances and Limitations

The evidence is very interesting since it highlights that VR is doing very well as new technology with huge interest in hardware and software components (Cipresso et al., 2018). Screen technology has improved during the last decade, as technologies like OLED have replaced legacy displays (CRT, plasma, and LCD). These new screens provide a higher pixel resolution, luminous output and contrast ratio (Rockcastle et al., 2021). The AR/VR devices are currently based on near eye displays (NEDs) technology. However, the quality of its visual appearance still leaves room for improvement (Díaz-Barrancas et al., 2020). Many factors influencing the faithful reproduction of colour and illuminance such as varying environment lighting conditions. While these effects are well known and grounded in existing literature, formal measurements of the illuminance and contrast of modern OST-HMDs are currently missing (Erickson et al., 2020).

A measurement system with high resolution and signal to noise ratio is required for these pixel dense displays. However, the wide field of view of NEDs which are integrated in HMDs makes this goal challenging to reach. To replicate human vision for HMDs, a measurement system must have the capability of high resolution measurement and replicating size and position of human eye. In addition, to the best of author's knowledge there is just one instrument on the market specifically developed for the HDM measurements (*AR/VR Display Test Solution*, n.d.)

4. Conclusion and future work

Some recent approaches have targeted the fact that the direct calculation of amount and distribution of light as well as the colour reproduction in the head mounted displays is a challenging task. The analysed works try to cover this gap through objective measurements. Despite the efforts, the review underlines

the need for further investigations aimed to characterise the HMD for lighting purposes better as well as to understand the link between how a virtual scene is displayed and perceived by users. The post-processing routines appear to affect the light distribution and colour reproduction strongly. But, yet, there exists no systematic approach which can clearly specify the relationship between the displayed scenes in the software and in the HMD.

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The role of the subjective assessment in lighting research using virtual reality

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Abstract

Immersive virtual reality allows showing people virtual environments with high levels of presence, realism and "feeling of being", as if they were in the real world. To reach this goal, virtual environments have to provoke perceptions that people experience in physical ones and ensure correct light distributions. A way to evaluate the virtual reality accuracy in reproducing real spaces is to perform experiments with human subjects. In this paper, the role of subjective assessments in lighting research using virtual reality is investigated. Review highlights that subjective assessments play an essential role in using virtual reality for lighting studies, being used to: i) compare virtual and physical environments, ii) compare different lighting scenarios and iii) investigate users' lighting preferences.

Keywords

Virtual reality, subjective surveys, lighting, daylighting, human preferences

1. Introduction

In the last years, people have spent a lot of time indoors, making it mandatory to guarantee a comfortable environment. Indoor environment conditions strongly affect users' satisfaction, health, and performance. In particular, the review carried out by (Konstantzos et al., 2020) underlined the impact of light conditions on human task performance.
Multisensory design tools, such as immersive Virtual Reality (iVR), allow considering both objective and subjective factors during the design process (Narasimha et al., 2019; Ruotolo et al., 2013; Scorpio et al., 2020). As a result, the use of VR for lighting design draws much interest in the scientific community. Nevertheless, virtual environments have to ensure a suitable reproduction of people's perceptions and light distributions. Currently, Head Mounted Displays (HMDs) are considered as the best way to present virtual spaces to users.
This paper presents a literature review of research where iVR is used to carry out lighting and daylighting investigations on people's lighting preferences and performances through subjective assessments. A specific focus on environmental and psychological factors, as well as tests performed, tools and surveys was given.

2. Methods, evaluations and data analysis

The methodology used for collecting the papers is shown in [fig. 1]. According to the literature [fig. 2], VR has been used for lighting and daylighting investigations aimed: i) to compare virtual and physical environments, ii) to display different light scenarios or iii) to evaluate the humans' interaction with systems to adjust daylight and electric light. The most common factor-analyses can be divided into Between-Subjects design (BS), when different groups of subjects are tested for each treatment, and Within-Subjects design (WS), when all subjects can be tested under each of the treatment conditions.

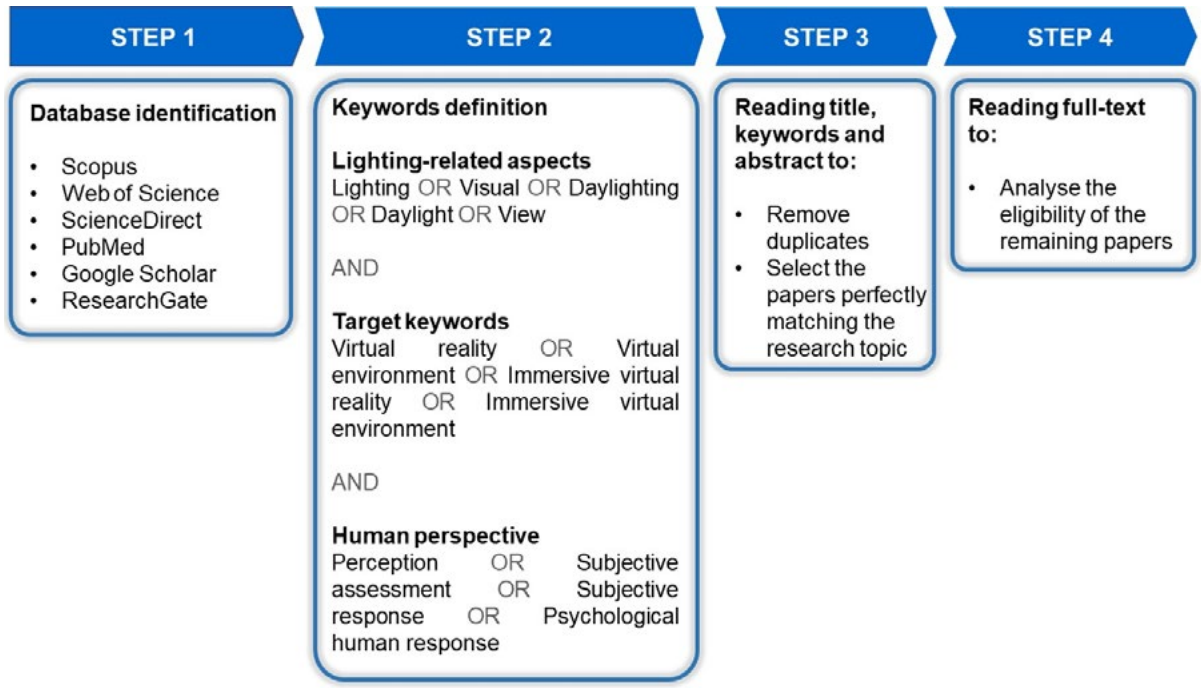

Fig 1. Review methodology

2.1. Comparison between virtual and real environments

In studies aimed to compare virtual and physical environments, a virtual model of the real space is built and participants are asked to judge both environments. Photographs, 360° panoramas, and 3D models are the most used formats to return a virtual space able to accurately evoke the physical one. Usually, the questionnaire is administered orally while the user is looking at the stimulus.
(S. Rockcastle et al., 2021) considered a studio space, (Higuera-Trujillo et al., 2017) a shopping environment, (Chen et al., 2019) a bedroom, and (Abd-Alhamid et al., 2019; Chamilothori et al., 2018; Heydarian, Carneiro, Gerber, Becerik-Gerber, et al., 2015) an office-like space.
Three studies (Abd-Alhamid et al., 2019; Chamilothori et al., 2018; Chen et al., 2019) were based on WS. The perceptual impression (aimed to assess the VR accuracy in reproducing the reality) was the only common aspect considered in all three studies. Data were analysed using the mean values and standard deviation, when the assumptions of normality and homogeneity of variance are met, or a non-parametric Wilcoxon Test, otherwise.
In (S. Rockcastle et al., 2021), the light conditions and the presence of glare between two groups of people were evaluated following a BS. The results for each lighting scene with ratings from the real and VR people groups, treated as two independent samples, are obtained through the Mann Whitney test.
BS and WS were used in (Heydarian, Carneiro, Gerber, Becerik-Gerber, et al., 2015) to evaluate reading speed, objects identification, the experience of virtual space, immersion and presence. The data about reading speed and objects identification were elaborated using t-tests (an inferential statistic to assess the differences between the mean values of two groups), while experience, sense of immersion and presence were analysed comparing mean values. Environment assessment, users' emotional state and sense of presence were explored in (Higuera-Trujillo et al., 2017) by using both BS and WS. The sense of presence was evaluated according to Slater, Usoh and Steed methodology, while other variables were interpreted with non-parametric Mann-Whitney U tests, mean values and standard deviations.
The main information are listed in [tab I].

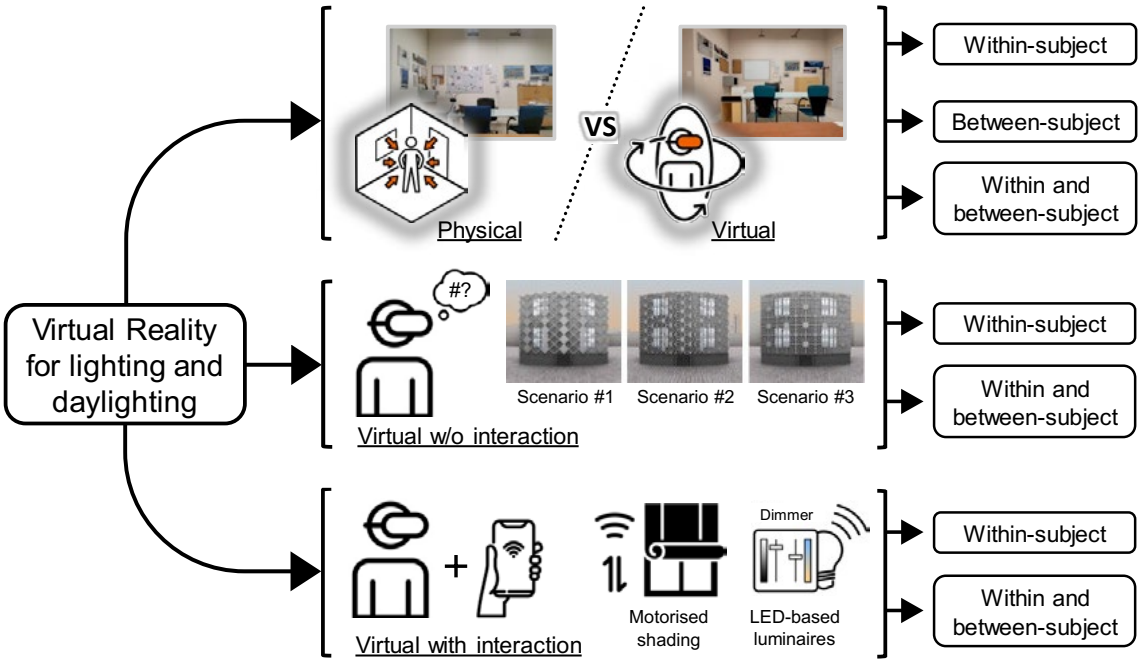

Fig 2. VR for lighting: investigation methods and factor-analysis

Tab I. Factorial design, participants and aspects mainly tested in virtual and real spaces comparison.

Author	Factorial design	Environment	Participants
(Chamilothori et al., 2018)	WS	Office	65 subjects
(S. Rockcastle et al., 2021)	BS	Studio space	30 subjects for real space, 23 subjects for VR
(Abd-Alhamid et al., 2019)	WS	Office	20 subjects
(Heydarian, Carneiro, Gerber, Becerik-Gerber, et al., 2015)	WS and BS	Office	120 subjects (30 x 4 groups)
(Higuera-Trujillo et al., 2017)	WS and BS	Shopping Environment	100 subjects (25 x 4 groups)
(Chen et al., 2019)	WS	Bedroom	40 subjects

2.2. Comparison between different light scenarios

Virtual reality is also used to compare scenarios with different light conditions. In this case, participants can not interact with the virtual model and have to evaluate each scenario. Usually, the test starts with a neutral lighting scene. After eyes adaptation, the subject has to examine the environment in detail and answer the questionnaire. The researcher administered the survey orally while the user was looking at the stimulus. In this case, office-like spaces were considered and, in most cases, the experiments were carried out following WS. Even if each study aimed to explore different aspects, the scene pleasantness, excitement and interest were considered in all studies. Also, different data analysis methods were applied, such as the Pearson Correlation Coefficient (S. F. Rockcastle et al., 2017), the Linear Mixed Model and Pairwise comparison (Moscoso et al., 2021) or Friedman's ANOVA and Wilcoxon Signed-Rank test (Flor et al., 2021).

Both WS and BS were used in (Chamilothori et al., 2019) to investigate the pleasantness, interest and excitement of an office-like room characterised with different façade and sunlight pattern geometry. The Wilcoxon Rank-Sum test was used for the BS, while Friedman's one-way ANOVA for WS. Post-hoc tests for all pairwise comparisons using a Wilcoxon Signed-Ranks Matched-Pairs test are conducted, in case of significant results in Friedman's ANOVA. A summary of the information described in this paragraph is listed in [tab. II].

Tab II. Factorial design, participants and aspects mainly tested in different lighting scenarios comparison.

Author	Factorial design	Environment	Participants
(S. F. Rockcastle et al., 2017)	WS	Office	65 subjects (minimum 15 subjects per scenario)
(Chamilothori et al., 2019)	WS and BS	Office	71 subjects
(Moscoso et al., 2021)	WS	Office	150 subjects in Norway 118 subjects in Switzerland 138 subjects in Grece
(Flor et al., 2021)	WS	Office	22 subjects

Tab III. Factorial design, participants and aspects mainly tested in humans' interaction evaluations.

Author	Factorial design	Environment	Participants
(Mahmoudzadeh et al., 2021)	WS	Office	30 subjects
(Heydarian, Carneiro, Gerber, & Becerik-Gerber, 2015)	WS and BS	Office	120 subjects (30 x 4 groups)
(Heydarian et al., 2017)	WS	Office	89 subjects

2.3. Humans' interaction with systems to adjust daylight and electric light

Finally, virtual reality is used to investigate the users' light preferences and evaluate how the light condition affects a visual task. With this aim, office-like virtual spaces, with adjustable electric lighting and shading systems, were built in the iVR modelling software. Participants are placed in a dark space and were asked to choose their preferred lighting condition. Once they feel comfortable with the lighting level, they can start to perform a reading task.

In (Heydarian et al., 2017; Mahmoudzadeh et al., 2021), the experiments were conducted following the (WS) to mainly investigate users' light preference, reading speed, and text comprehension. Data were analysed through Wilcoxon signed-rank test in (Mahmoudzadeh et al., 2021) and a set of chi-square test in (Heydarian et al., 2017).

Both WS and BS were adopted by (Heydarian, Carneiro, Gerber, & Becerik-Gerber, 2015) to evaluate the effects of presence and typology of light controls on lighting preferences of four groups. Reading speed and text comprehension as well as the interaction with virtual reality and environmental responsibility were also considered. Chi-square tests were utilised to analyse subjective data. [Tab. III] lists the main information from the reviewed papers.

3. Results and discussion

The review results suggest that subjective assessments are a powerful tool for lighting investigations using VR. The questionnaires allow evaluating the accuracy of a methodology in modelling the light distribution in the physical environment as well as obtaining information about users' preferences, emotional state and visual comfort. Virtual reality has also proved to be adequate for analysing humans' performance in performing visual tasks, such as reading a text or recognizing objects located inside or outside the room. The number of people considered in the different studies, less than 40 subjects for studies based on WS and more than 70 in a BS, is in line with that suggested in lighting-performance literature.

Despite these potentialities, the review underlines a lack in standardisation of subjective assessments and data analysis methodologies, making it difficult to compare the results from different research. Finally, VR is used to investigate light conditions in office-like spaces, calling for experiments to evaluate the feasibility of this technology for other applications.

4. Conclusions

In this paper, a review of the studies aimed at evaluating electric lighting and daylighting users' perception, emotion and preferences through VR was carried out. If, on the one hand, the results confirm the benefit and reliability of virtual reality for lighting investigations, on the other, they bring out limitations and opportunities that call for further investigations.

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On the use of low-cost thermohygrometers for wearable application in the built environment

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Abstract

At a time when the market offers the opportunity to bring electronics closer to the end user, and applications and open-source projects using low-cost sensors proliferate, a critical laboratory analysis of seven low-cost thermohygrometers is conducted. Some devices, equipped with an internal sensor to measure relative humidity and temperature, are selected based on their similar technical characteristics, small size, popularity and low budget. The analysis allows to verify the possibility of using these types of devices to assess thermal comfort in the built environment, both with classical methods and considering a new assessment methodology focused on humans.

Keywords

thermo-hygrometer, low-cost, wearables, lab evaluation, performance test

1. Introduction

The Internet of Things (IoT) is a network of connected devices designed for ease-of communication and often a low-cost or portable nature. IoT approach has allowed the web to evolve from the static websites of the 1990s to the Web 2.0 (Social Networking Web) of the 2000s, to the Web 3.0 (Ubiquitous Computing Web) of the present (Gubbi, Buyya, Marusic, & Palaniswami, 2013), (Atzori, Iera, & Morabito, 2010) and the Do-It-Yourself (DIY) approach. This latest iteration enables the user to become the maker of low-cost and open hardware technologies that can be used in any technological field. Anyone, anywhere, can implement the principles of the DIY and IoT philosophy using technologies such as Arduino, a series of microcontrollers based on open-source hardware and equipped with digital and analogue input/output pins that can be connected to various sensors or expansion boards, or Raspberry Pi, a series of small single-board computers mainly used for learning programming, to quickly develop and share smart, low-cost and DIY approach-based solutions with other makers and researchers. DIY paradigm is on the rise, and the motivations for leveraging this movement have been studied (Roelands et al., 2011). A holistic view of enabling DIY creation using IoT has also been explored (Gubbi et al., 2013). Furthermore, as the number of smart devices increases, we are gradually entering the era of intelligent IoT (Chu & Song, 2021), (Xin, 2020) where vast amounts of data collected by "smart things" are used to train machine learning algorithms or, more generally, to develop Artificial Intelligence (AI) applications.
The use of IoT devices is on the rise in the field of building control as well. As highlighted in (Ulpiani, Nazarian, Zhang, & Pettit, 2021), the need has been established for high spatial and temporal resolution

monitoring of environmental quality, which can then be incorporated into human-centred and automated control measures to improve thermal comfort. This effort requires the deployment of low-cost, IoT-based environmental sensors that establish buildings as living laboratories for the integration of innovative sensing, data analysis and automated control methods. In this context, it becomes clear that there is a need to consider affordable and accurate low-cost solutions for monitoring environmental variables that can be used as an alternative to expensive hardware to help the understanding of how environmental variables (such as air temperature and relative humidity), can impact the comfort perception of different occupants during their daily lives.

Currently, thermohygrometers, consisting of a thermometer to measure air temperature and a hygrometer to measure humidity in a single device, are used for research purposes and often take advantage of low-cost sensor technology. For example, in a recent study, they are used in physical environments to improve the user experience (Uzelac, Gligoric, & Krco, 2015). In another study described in (F. Salamone et al., 2018) and (Francesco Salamone et al., 2018), thermohygrometers are used in combination with other sensors in a framework to assess user-perceived thermal comfort using Machine Learning (ML) techniques. Thermohygrometers have also been used in combination with other sensors to assess the indoor thermal comfort for people with health problems (Dieffenderfer et al., 2016). Outdoors, they have been used to collect data from a pedestrian perspective (Pioppi, Pigliautile, & Pisello, 2020), (Cureau, Pigliautile, & Pisello, 2022) for the monitoring of microclimatic conditions in cities, e.g. to study how different urban configurations and architectural designs can affect the urban microclimate, or to understand the impact of the Urban Heat Island (UHI) on human thermal sensation in the hottest seasons.

It is not so easy to assess human responses to indoor and outdoor environments, as there are many interactive factors that are very complex (Torresin, Pernigotto, Cappelletti, & Gasparella, 2018)., and there is a lack of studies on combined factors in laboratory because experimental design is complex and time-consuming and the hardware to simultaneously monitor the required different environmental variables is expensive (Hancock & Pierce, 1985). The use of low-cost solutions could facilitate the replication of studies in real-world contexts and enable the identification of new user comfort and health frameworks by using a human-centred approach which is gaining popularity in the scientific community because it allows for the consideration of multiple factors related to human sensation and the complex state of mind that interacts in the perception of thermal comfort (Mackey, 2015).

To advance the possibility to use low-cost devices in human-centred studies, we have defined a procedure to evaluate the performance of seven different low-cost thermo-hygrometers. All of them are characterised by a price of less than 60 €, dimensions of less than 35x 35 x 8 mm and measuring range for air temperature and relative humidity suitable for measurements in the built environment (Ta at least in the range of 0-50°C and RH at least in the range of 20-90%). They are compared with reference devices in a controlled environment to understand the differences in determining classical indices for indoor and outdoor thermal comfort and stress evaluations. This article presents the materials and methods used and the main results. The main objective is to evaluate the performance of commercial, low-cost thermohygrometers to support the development and informed use of such environmental monitoring solutions.

2. Materials and Methods

The focus of this experiment is the development and testing of seven low-cost thermohygrometers connected to the Arduino Mega 2560 Rev3, which is used as a data logger. The seven low-cost thermohygrometers are: DHT22 (“DHT22 temperature and humidity sensor,” n.d.), DHT11 (“DHT11 temperature and humidity sensor,” n.d.), DHT20 (“DHT20 temperature and humidity sensor,” n.d.), SHT85 (“SHT85 temperature and humidity sensor,” n.d.), SHTC3 (“SHTC3 temperature and humidity sensor,” n.d.), SCD30 (“SCD30 temperature, humidity and CO2 concentration sensor,” n.d.), BME680 (“BME680 temperature, humidity, pressure and air quality sensor,” n.d.) [fig. 1a].

The low-cost hardware was installed in a box and wired to the Arduino Mega 2560 rev3 and the Real Time Clock (RTC) module. Four reference sensors were installed around the low-cost sensors. The system was first analysed with thermal infrared imaging to avoid systematic instrumental errors. It was then placed in a climatic chamber [fig. 1b] where the temperature and relative humidity were controlled. Over ten cycles, the temperature profile changed between -10 and 40°C, while the relative humidity profile ranged between 0 and 90%. The following section lists the main results.

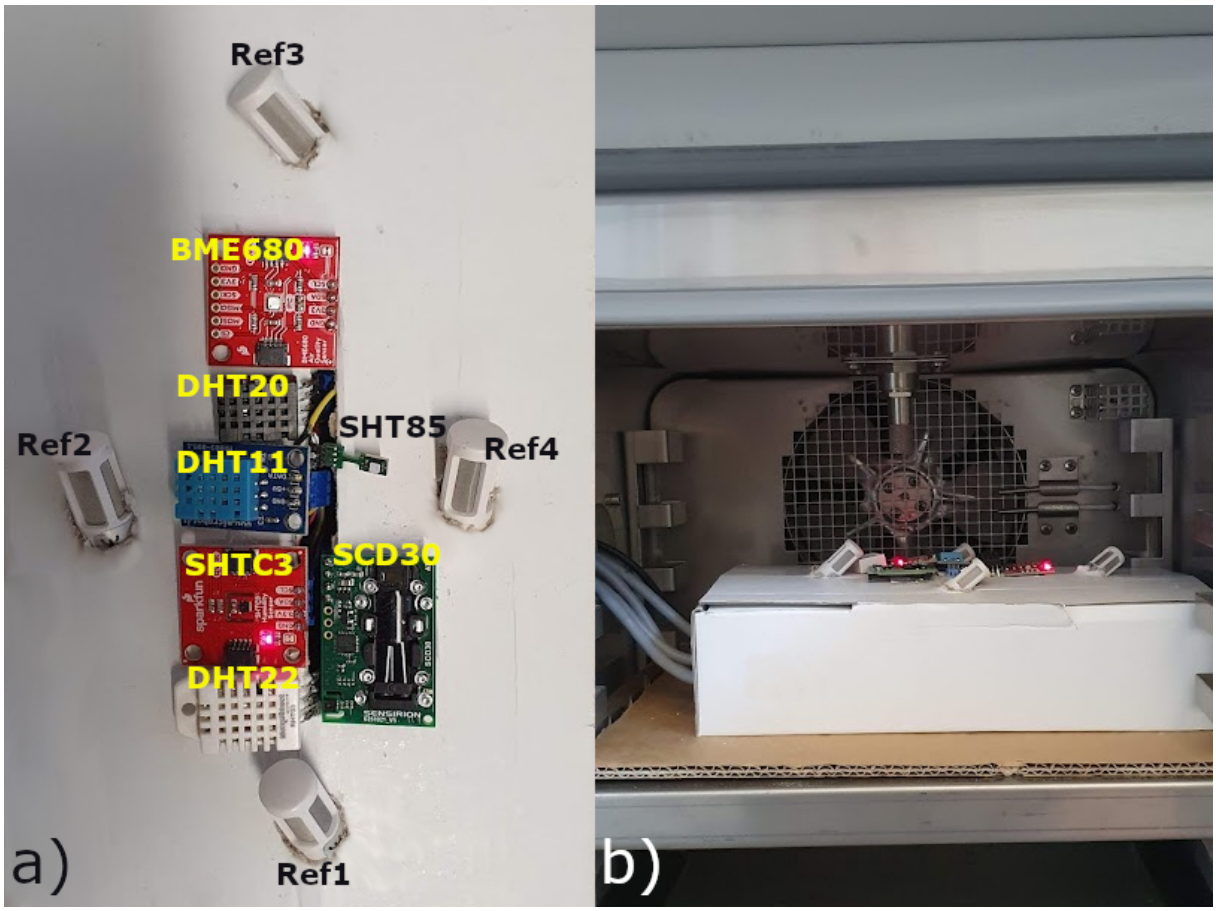

Fig 1. Set up: a) considered sensors; b) sensors in climatic chamber

3. Results

[fig. 2] shows the ridge plots with Kernel Density Estimate (KDE) profiles for all monitored data. KDE plot is a method of visualising the distribution of observations in a dataset, similar to a histogram. Instead of using discrete bins, a KDE plot smooths the observations with a Gaussian kernel, resulting a continuous density estimate ("Kernel density estimation," n.d.).
The results show that the relative humidity and air temperature are almost constant when considering the values measured by the four reference sensors (ref1, ref2, ref3 and ref4 in [fig. 2]). The air temperature profiles [fig. 2a] of all the low-cost sensors are consistent with those of the reference sensors, except for the DHT11, which failed to record the negative values of air temperature, and the SCD30 sensor, which recorded higher air temperature data compared to the reference values. The relative humidity profiles [fig. 2b] are consistent with those recorded by the four reference sensors, except for the DHT11 sensor, whose recorded values are inconsistent, and the DHT20, which does not seem to follow the RH lowest values. Apart from these anomalies, all sensors follow the reference profile correctly without recording any deviation, even at the end of the tenth cycle.

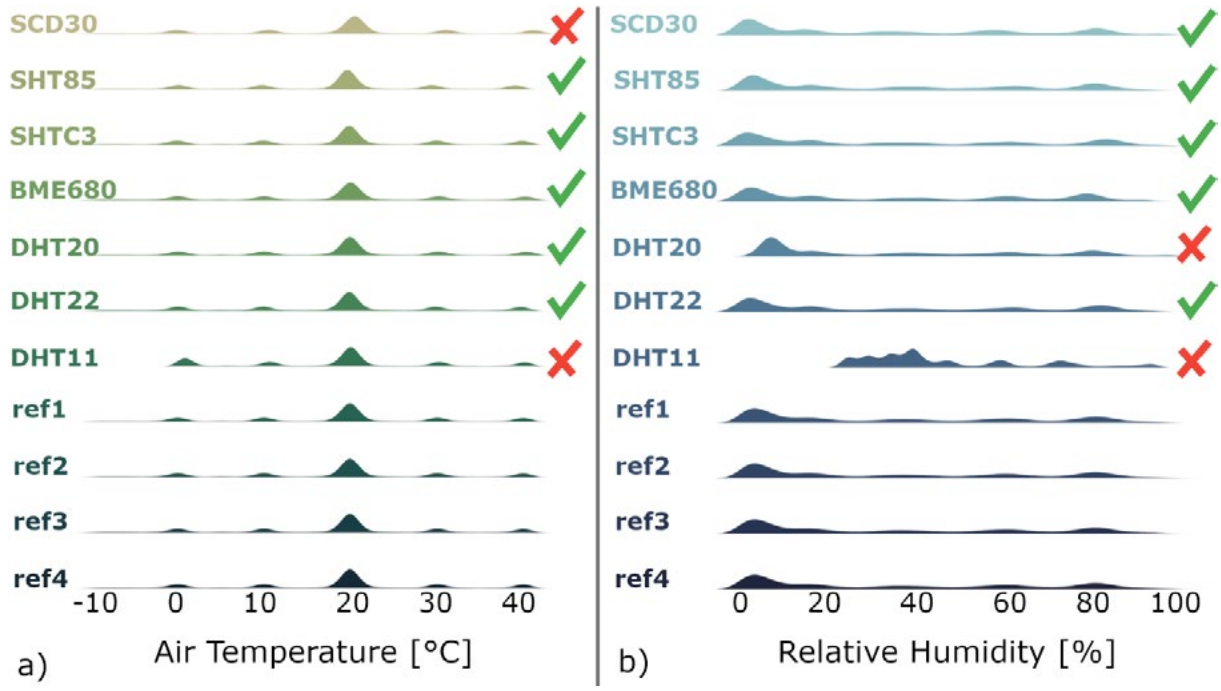

Fig 2. Ridge plots of all monitored data: a) Air temperature in [°C]; b) Relative humidity in [%]. With green tick the profiles that reflect the trends of the reference sensors (ref1, ref2, ref3 and ref4) and with a red x the profiles that don't reflect them.

4. Conclusion

The research study focused on testing and evaluating the performance of 7 different models of low-cost thermohygrometers in a controlled laboratory environment. The results show that 4 sensors, the SHT85, SHTC3, BME680 and DHT22, have a good profile compared to the reference sensors. On the other hand, three sensors, the SCD30, DHT20, and DHT11, show some limitations in monitoring one or both variables. We can conclude that the four selected low-cost sensors can be widely used, both for *classical* comfort assessment methods and for the development of new devices, for example wearable, that allow defining new comfort models that consider the user's subjective perception and the environmental conditions around the user. As the qualitative results presented here will be the subject of further research, the main limitations of this study refer to the test carried out in a single climatic chamber with a single set of reference sensors and without considering several low-cost sensors of the same type.

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08 High Performance Components & Buildings

Prefabricated movable modular building solutions exploiting renewable sources: energy systems review

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Abstract

This paper reviews 5 of the most significant examples of prefabricated buildings, temporary in its use, modular in design, flexible in set-up, requiring minimal site preparation and meeting its energy demands thanks to renewable energy sources.
This review has been carried out by analysing the purpose, geometry, thermo-physical characteristics of buildings' envelope, energy demands, as well as technologies and energy sources used for covering energy needs and controlling indoor comfort conditions.
The analysis has been performed with the aim of highlighting the current research gaps, provide evidence of the best practices and support future design and development of innovative ideas.

Keywords

prefabricated buildings, movable buildings, modular buildings, renewable energy sources, energy and environmental sustainability.

1. Introduction

The building sector is responsible for about 40% of worldwide primary energy consumption and about 24% of related greenhouse gas emissions. The revised "Energy Performance of Buildings Directive" (EPBD Recast 2021) sets out how Europe can achieve a zero-emission and fully decarbonized building stock by 2050. This goal can be achieved by a multidisciplinary approach addressing bioclimatic design, construction and energy efficiency, building integration of renewable sources. In this perspective, prefabricated buildings could emerge as cost-and-energy saving solutions to be designed according to sustainable construction practices and taking into account that the aspects of health, well-being and productivity are affected by indoor thermo-hygrometric conditions as well as additional factors concerning the sense that end-users perceive of the surrounding environment (such as fascination, being-away, coherence and scope). These factors can be influenced by physical environmental parameters (microclimate, sound, light) as well as emotional factors, linked to the presence of elements/artifacts of historical/architectural/naturalistic value.

2. Energy review of existing prefabricated movable modular building solutions

In the next sub-sections, the most significant 5 examples of prefabricated, temporary and movable buildings are briefly described and analysed. The selection of case studies has been performed by considering only the solutions exploiting the solar source by means of photovoltaic panels and controlling indoor air temperature during both winter and summer.
This review has been performed by analyzing the purpose, geometry, thermo-physical characteristics of building envelope, energy demands, as well as technologies and energy sources used for controlling indoor comfort conditions. Each sub-section has been devoted to a specific building model.

2.1 Smart-POD

The Smart-POD model [figs.1-a1, 1-a2] has been studied by Ceranic et al (Ceranic, 2018).
It has been designed as response to an unexpected increase in pupil numbers of schools, or as a replacement during the refurbishing of existing schools or to support the continuous operation of unsafe/damaged schools.
The model has a net floor area of 117 m^2.
It satisfies the electric demand through the installation of 40 m^2 photovoltaics (PV) panels installed on the roof; the electric surplus is sold to the electric central grid or stored into a lithium-ion battery. Heating requirements are covered by means of a thermal storage of 9 m x 6 m x 0.5 m crushed rock bed, and/or through a mechanical ventilation heat recovery system, and/or an air-to-air electrically-driven vapor-compression heat pump depending on boundary conditions. Both the thermal storage and the mechanical ventilation heat recovery system could also be used for cooling purposes.
The installed LED appliances are controlled according to illuminance levels and occupancy sensors.
Rainwater harvesting could be adopted for toilet and/or for drinking purposes thanks to the use of filters and UV treatment.

2.2 Pre-fab ECO Smart House

The “Pre-fab Eco Smart House” model [figs.1-b1, 1-b2] has been developed by a research team also including the University of Cyprus (Michaela, 2020; Vassiliades, 2022).
A mobile “kit-of-parts” system has been developed; it consists of 7 structural components that can be juxtaposed in different configurations.
Windows, walls and shading devices have also been developed with a “plug n’ play” logic since they are modular, with dimensions of 1.00 m width and 2.70 m height.
The internal space has a total net floor area of 20.7 m^2 and a height of 2.7 m. The total volume is 55.89 m^3.
The building envelope has the following thermal transmittance values: 0.280 W/m^2K for exterior walls, 0.316 W/m^2K for the floor, 0.263 W/m^2K for the roof, 2.00 W/m^2K for the glazings.
The heating/cooling demands are covered by an electric reversing heat pump. C. Vassiliades et al. (Vassiliades, 2022) investigated the adoption of 2 hybrid building-integrated photovoltaic/thermal (BIPV/T) solar systems consisting of a single PV panel (1 m x 2.50 m) with a 0.08 m thick insulation on the back. An air gap of 0.05 m between the back of the PV panel and the insulating layer is adopted; to enhance the heat removal from PV cells, a set of 4 fans are placed within the air gap. The electric output of the systems is used to power air-to-air electrically-driven vapor-compression reversing heat pump; the surplus is sold to the central grid, that is also used to cover the peak demands.
Simulations performed with the dynamic simulation software TRNSYS showed that the configuration including the BIPV/T systems can lead to a primary energy saving up to 548% for the city of Larnaca (Cyprus) and 180% for the city of Bolzano (Italy) with respect to the configuration without the BIPV/T systems.

2.3 Ecocapsule Original

The “Ecocapsule Original” model [figs.1-c1, 1-c2] has been designed by the Nice Architects Studio of Bratislava in 2018 (Ecocapsule), for medium term off-grid living of 1÷2 people.
It can become a cottage, pop-up hotel, mobile office, a research station or can be used in case of interventions in emergency areas.
It has a length of 4.67 m, a width of 2.20 m and a height of 2.50 m, with a net floor area of 6.3 m^2 and a total volume of 25.68 m^3. It has 2 openable and 2 fixed triple-glazed windows.
The exterior part is made of insulated fiberglass shells overlaying a steel framework.
Solar and wind sources are used to cover the energy demands. The PV panels, with an area of 2.6 m^2 and a peak power of 880 W, are installed on the roof, while the wind turbine, delivering up to 750 W, is positioned on a telescopic pole. Both systems can store energy in lithium-iron phosphate (LFP) batteries with a nominal total capacity of 9.7 kWh. The model features a specially-customized plant providing cooling (up to 970 W) and heating (up to 1050 W) by means of a vapor-compression electric reversing heat pump; the required air change rates are satisfied by means of a mechanical ventilation heat recovery system (up to 130 m^3/h).
In the model there are 3 tanks: (i) harvested water tank (96 L) containing rainwater that is disinfected

via a pre-filtration system and a UV LED lamp; (ii) grey water tank (96 L) containing waste water from the shower and sinks, and (iii) black water tank (24 L) containing urine.
The capital cost of the model is 79,900 €.

2.4 Living Box

The "Living Box" model has been proposed by (Leoncini, 2016) [figs.1-d1, 1-d2].
It has been designed considering 2 cells' typologies (A-type and B-type): the A-type cell has a net internal height equal to 2.70 m, while the B-type cell has a net internal height equal to 2.40 m.
It has a length of 8 m, a width of 8.80 m and a height of 3 m, with a net floor area of 45 m^2 and a total volume of 211.2 m^3.
The model has 2 openable and 5 fixed double-glazing windows, characterized by a thermal transmittance equal to 1.5 W/m^2 K.
Thermal transmittance of the walls is 0.207 W/m^2 K for the A-type cell and 0.308 W/m^2 K for the B-type cell; thermal transmittance of the roof is 0.138 W/m^2 K.
A heating, ventilation and air-conditioning plant, including an air-to-air electrically-driven vapor-compression reversing heat pump, is used to control the indoor thermal comfort. The domestic hot water (DHW) is produced by means of an air-to-water heat pump, connected with a storage tank of 150 L. A PV plant of 36 modules, having each a peak power of 87.5 W, has been architectonically integrated in the roof of the A-type cells; solar thermal devices are installed over the roof of the B-type to supplement the production of DHW.
The performance of the proposed model has been analyzed under 3 different Italian climatic conditions (Bolzano, Florence and Reggio Calabria) by means of a semi steady-state approach, highlighting that it behaves as an "Energy Positive Building" (i.e., with an energy production larger than that one consumed).

2.5 Biosphera Equilibrium

The "Biosphera Equilibrium" model [figs.1-e1, 1-e2] has been realized by Aktivhaus in 2018 (Biosphera Project).
It can become a real home for 2 people, a classroom for 11 people or a mobile office for 3 people. It has a length of 15.3 m, a width of 2.97 m and a height of 3.28 m, with a net floor area of 30.45 m^2 and a total volume of 67.16 m^3.
It has 3 openable and 2 fixed triple-glazing windows.
The external structure of the model is characterized by 5-layer X-LAM timber panels, and insulated with rockwool.
It uses the solar source to cover the energy demands through 2 generation systems: the first consists of 19 PV panels positioned on the roof, while the second one is an innovative PV system applied on the façade of the model. The total peak power of the PV system is equal to 8 kW, with an annual electricity production capacity of 8000 kWh/year. Taking into account that the model is characterized by an annual electricity consumption of 2000 kWh/year, the electricity surplus produced by the PV system is stored into the "ZHERO" battery (with a storage capacity of 20 kWh). In the model the cooling/heating demand is covered by using radiant panels installed into the ceiling as hydraulic terminal units.
As for lighting, LED lamps allowing to vary both luminous flux and correlated color temperature are used.

3. Discussion and conclusions

The tab. I summarizes the characteristics of the selected case studies, highlighting that floor area ranges from 6.3 up to 90 m^2, U-value of opaque envelope is within 0.10 and 0.316 W/m^2 K, maximum U-value of windows is 2.00 W/m^2 K, area of PV panels per unit of floor area varies between 0.24 and 3.51, both thermal storage and electric battery are used in 3 solutions out of 5. These data could support future design of innovative prefabricated movable modular building solutions exploiting solar source for controlling indoor air temperature during both winter and summer.

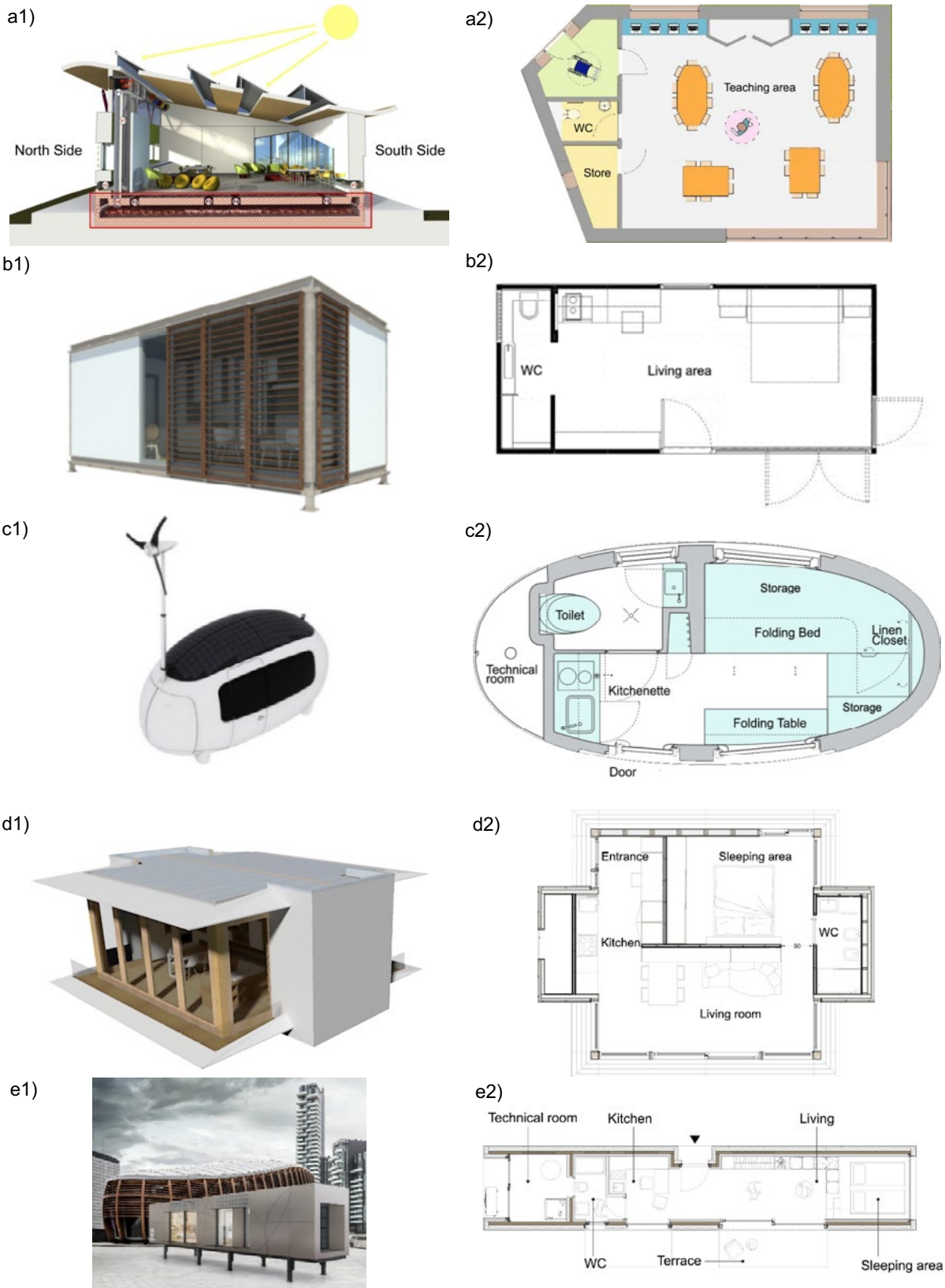

Fig 1. Exterior aspect and floor plan of: Smart-POD model (a1,a2) (Ceranic, 2018); Pre-fab ECO Smart House model (b1,b2) (Michaela, 2020, Vassiliades, 2022); Ecocapsule Original model (c1,c2) (Ecocapsule); Living Box model (d1,d2) (Leoncini, 2016); Biosphera Equilibrium model (e1,e2) (Bioshpera Project).

Tab I. Main characteristics of the 5 reviewed prefabricated movable modular building solutions.

	Smart-POD (Ceranic, 2018)	**Pre-fab Eco Smart House** (Michaela, 2020) (Vassiliades, 2022)	**Ecocapsule Original** (Ecocapsule)	**Living Box** (Leoncini, 2016)	**Biosphera Equilibrium** (Biosphera Project)
Volume	462.2 m^3	55.9 m^3	25.7 m^3	211.2 m^3	67.2 m^3
Net floor area	117.0 m^2	20.7 m^2	6.3 m^2	45.0 m^2	30.45 m^2
U-value of opaque envelope	0.10÷0.12 W/m^2 K	0.280 W/m^2 K (Walls) 0.316 W/m^2 K (Floor) 0.263 W/m^2 K (Roof)	Not specified	0.207 W/m^2 K (A-type cell) 0.308 W/m^2 K (B-type cell) 0.138 W/m^2 K (Roof)	Not specified
U-value of windows	0.70÷0.75 W/m^2 K	2.00 W/m^2 K	Not specified	1.50 W/m^2 K	Not specified
Lighting	LED lamps	Not specified	LED lamps	Not specified	LED lamps
Annual electric energy demand	3014.60 kWh/year (location not specified)	2149 kWh/year (Larnaca, Cyprus) 2761.00 kWh/year (Bolzano, Italy)	Not specified	2781.00 kWh/year (Bolzano, Italy) 2576.00 kWh/year (Florence, Italy) 2457.00 kWh/year (Reggio Calabria, Italy)	2000.00 kWh/year (location not specified)
Ventilation	Natural and mechanical	Natural and mechanical	Natural and mechanical	Natural and mechanical	Natural
Electricity generation	40.0 m^2 PV panels (5093.0 kWh/year)	5.0 m^2 BIPV/T	2.6 m^2 PV panels (peak power of 880.0 W) / Wind turbine (peak power of 750.0 W)	41.0 m^2 BIPV/T (Peak power of 3150.0 W)	107.0 m^2 PV panels (8000.0 kWh/year)
Cooling	Mechanical ventilation heat recovery and/or thermal storage	Air-to-air electrically-driven vapor-compression refrigerating unit	Air-to-air electrically-driven vapor-compression refrigerating unit (cooling power up 970.0 W)	Air-to-air electrically-driven reversing heat pump	Radiant ceiling
Heating	Air-to-air electrically-driven vapor-compression heat pump or mechanical ventilation heat recovery and/or thermal storage	Air-to-air electrically-driven vapor-compression refrigerating unit	Air-to-air electrically-driven vapor-compression heat pump (heating power up to 1050.0 W)	Air-to-air electrically-driven reversing heat pump	Radiant ceiling
Thermal storage	9 m x 6 m x 0.5 m crushed rock bed storage (part of the foundation module)	Not specified	3 sensible water tanks (harvested water (96 L), grey water (96 L), black water (24 L))	1 sensible water tank (150 L)	Not specified
Electric storage	Lithium-ion battery	Not specified	Lithium iron phosphate batteries	Not specified	"ZHERO" battery (capacity of 20.0 kWh)
Non potable water	Rainwater harvesting	Not specified	Rainwater harvesting	Not specified	Not specified
Potable water	Rainwater to drinking water system	Not specified	Rainwater to drinking water system	Not specified	Not specified

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Second-skin façades and usage of textile materials in the building envelope: literature review, limitations, and future opportunities

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Abstract

A big part of global energy consumption is accounted to buildings. Developing the building stock in energy-efficient ways is crucial to achieving sustainable growth worldwide. This paper reviews and examines the most recent and cutting-edge research in second-skin and responsive façades for new and existing buildings. Each study is characterized based on the material, location, building usage, main findings, results and method of investigation. The objective of this paper is to identify possible benefits and recurrence of the methods discussed, such as reduction of energy consumption and energy savings, and to identify the critical barriers, such as overheating risk and high cost of responsive components, which need to be addressed and resolved in the future. The results show that these approaches can improve the efficiency and the thermal properties of buildings, decreasing their energy consumption and polluting emissions, positively affecting global and local warming.

Keywords

Second-Skin Façade, Responsive Façades, Textile Materials, Building's Energy Saving, Building sustainability.

1. Introduction

Worldwide primary energy consumption of buildings is about 30-40% and accounts for nearly a third of greenhouse gas (GHG) emissions (Huovila, 2007). These numbers can be reduced by providing smart buildings, able of adapting to their environment by combining perception, reasoning, and actions (Habibi et al., 2022). One of the effective solutions for energy efficiency includes improving the building envelope by Second-Skin façade (SSF) (Naimoli, 2020). Besides its protective function, other benefits are the control of light transmission, air exchange rate, visual connection with the outdoor, and aesthetics. Also, the rapid advancement of textile materials has provided constant stimuli for SSF innovation during the last few decades. As a result, textiles are crucial for creating intelligent, flexible building shells that enhance and complement the range of the conventional building materials (Cremers, 2011).
This work analyzes the most recent academic research on such technologies, highlighting their main advantages and limitations. In particular, we propose a review concerning SSFs, especially integrating textile materials, as a solution for minimizing energy consumption and improving indoor thermal and visual comfort.

2. State of the Art

Second-Skin Façades (SSFs) have become more and more popular in recent years. The SSFs are composed of an outer skin (usually glass) over the actual building façade. An air cavity separes the two layers, with fixed inlets and outlets and shading devices (Alberto et al., 2017a). The main reasons of the popularity of SSFs are:

- Daylight control
- Solar gains or losses control
- Energy saving
- Thermal comfort
- Acoustic comfort
- Aesthetic values

There are, however, some drawbacks to this system. For example, several cases (Braham, 2005; Ding et al., 2005; Gratia & de Herde, 2004, 2007) report the risk of overheating during the summer. To solve this problem, Several SSFs were investigated in southern Europe (Alberto et al., 2017), highlighting how the most critical is the facade orientation, accounting for up to 40% difference in energy demand between north and south facades.
From the scientific literature, several studies were investigated. In (Yoon et al., 2019), a reduction of 30% in heating energy was obtained by installing the SSF. In Egypt (Bolteya et al., 2021), the double glazed windows were filled with phase change materials (PCM) improving their thermal efficiency, reaching a reduction of 9.44 °C (on the window's internal surface) and 223.9 W/m2 (on the transmitted radiation) by adopting a 50 mm thick PCM layer. The PCM integration was also studied, in mild climate, in combination with thermochromic (TC) glass, returning up to 13% (TC), 15% (PCM), and 17% (TC/PCM), in terms of total energy saving (Hu & Yu, 2020). In a recent study (Habibi et al., 2020), a novel assessment model investigated five Intelligent Façade Layers (IFL): ETFE inflating cushion, Bioreactor panels, Ever-changing PC show, Kinetic PTFE and TiO2 covered thermoformed tiles. These IFLs provided an improvement in terms of energy saving ranging between 37% (TiO2 tiles) and 85% (Bio-panels). A Building Integrated Photovoltaic Panels (BIPV) system was used in the Middle Eastern climate (Shakouri et al., 2020), increasing the energy efficiency by 34.3% and reducing the annual cooling and thermal loads by 25.1 MWh and 17.8 MWh, respectively. The overall energy performance of a PhotoVoltaic (PV) SSF and a PV insulating glass unit (PV-IGU) were compared in five climates in China (Wang et al., 2017), highlighting a potential energy saving of about 28.4% (PV-SSF) and 30% (PV-IGU). In (Flor et al., 2022), clear, fritted and switchable ETFE was integrated as outer skin in SSF, in order to assess the daylight performances on different building scenarios and climates. It was found that by changing the WWRs (30–90%), the annual useful daylight illuminance (UDI) will increase from 11 to 69%. In addition, the best scenario case returned a 59% reduction of glare probability (DGPs) and a 19% improvement of the daylight uniformity ratio (UR) when compared with a conventional glass SSF. A combined system has been analyzed, varying: (i) material type (Plastic Fabric, ETFE, ETFE white), (ii) cavity depth and (iii) transparency (Scorpio et al., 2019). Among six case studies, the optimal results were achieved by the ETFE or white ETFE (energy saving up to 45.10% and emission reduction up to 5.84 kgCO2) which improved the UDIUseful index.
Then, the analysis concerned also architecture references, most notably the "King Fahad National Library" and the "Serpentine Sackler Gallery". In the former, white textiles inserted in the facade act as sunshades in a modern and technological way, controlling the solar radiation and the energy consumption (King Fahad National Library Riyadh, 2014a), while in the latter, the outer skin is made of three layers in order to minimize its weight: an external PTFE-coated textile layer for wind loads, a middle fire-rated mineral fiber insulation, and an inner flexible silicone-coated fabric (Serpentine Sackler Gallery, 2014).
The next tables summarize the scientific [table.I] and architecture [table.II] references.

Tab I. Summary of the scientific references on second skin facades included in this review.

Year	Location	Analysis	Software/ Method	Material	Type of Building	Results	REF
2022	Oceanic/ Mediterran-ean/ Sub-Tropical	Simulation/ Experimental	BSDF/ Radiance/ Grasshopper/ WWR/ Test-box	Fritted and Switchable ETFE	Office	Annual UDI increase from 11 to 69% / Reduction of Glare up to 59% / Improvement of UR up to 19% / Increasing the UDI time	*(Flor et al., 2022)*
2020	Tehran (IR)	Simulation/ Experimental	EES/ MATLAB/ DesignBuil-der/ PV module test	BIPVT	5-floor Office	Reduction of annual cooling and thermal loads / Producing of electricity / Energy performance improvement by 34.3%	*(Shakouri et al., 2020)*
2020	Beijing, Heilongjiang, Nanjing, Guangzhou, Kunming (CN)	Simulation	EnergyPlus	Thermochro-mic (TC) Coating/ PCM layer	Office	Total energy saving up to 13% (TC), 15% (PCM), and 17% (TC/PCM)/ better performance in the mild climate/ TC/PCM allows seasonal control/ Inreasing the PCM thickness layer from 5 mm to 25 mm improves the perfromances up to 10%.	*(Hu & Yu, 2020)*
2020	Melbourne (AU)	Simulation	EnergyPlus / Python / MFA / Eppy toolkit	Adaptive glasses (U-value 0.1–10 W/m^{2}K and τ_{vis} 0.05–0.9)	office room/ medium office building	For the office room, the energy saving is 18.8–29.0% in the summer and 14.9–22.7% in the winter, thile for the office building the total energy saving is 14.2–22.3%	*(Bui et al., 2020)*
2019	Naples (IT)	Simulation/ Experimental	TRNSYS/ Radiance/ Test-cell	Plastic Fabric/ ETFE/ White ETFE	Sample room	The UDI percentage increase at the decreasing of the visual transmission values of the used material/ ETFE and ETFE white are the optimal ones	*(Scorpio et al., 2019)*
2020	Karaj (IR)	Simulation/ Experimental	Matlab	Solar oriented fabricated SSF (Polycarbon-ate sheets)	Office room	Decrease of the air conditioning inlet temperature between 4 and 6 °C in summer/ Reduction of cooling energy consumption up to 0.27kWh/(m^2 day).	*(Radmard et al., 2020)*
2020	South of Italy	Simulation	ANSYS Fluent	Opaque ventilated façade (OVF)	-	Energy saving ranging from 20 to 55%/ Outer surface of OVF had lower temperature up to 20 °C less than an ordinary wall	*(Gaglia no & Aneli, 2020)*

3. Results

The main findings from the review are summarized in [Fig. 1]. All studies are categorized in three categories: Materials, Methods and Results. In most reviewed studies, the performances of the proposed methods were compared with conventional facades. In terms of materials, the ETFE, PCM and BIPVT were the most investigated. In terms of Methods and Results, most of the research is carried out on single parameters (energy, thermal or optical).

Tab II. Architecture case studies integrating second skin facades.

Study Cases	Location	Skin's Type	Material	Photo	REF
King Fahad National Library Riyadh	Riyadh (SAU)	White textile inserts	Teflon reinforced with fiberglass		*(King Fahad National Library Riyadh, 2014a) (King Fahad National Library, 2013)*
London Shooting Venue	London (UK)	Double curved membrane (movable)	Phthalate-free PVC		*(London Shooting Venue, 2012)*
Serpentine Sackler Gallery	London (UK)	Free-form membrane	PTFE, Atex 2000 Silicone Coated Glass and insulated fireproof layer		*(Serpentine Sackler Gallery, 2013) (Serpentine Sackler Gallery, 2014)*
The 2015 Serpentine Pavilion	London (UK)	Textile SSF	Multi-coloured ETFE sheets and webbing		*(Serpentine Pavilion, 2015a) (Serpentine Pavilion, 2015b)*
RMIT Design Hub Building	Melbourne, Australia	Moving sunshading	Glass discs (will be covered by PVs in the future)		*(RMIT Design Hub Building, 2012)*

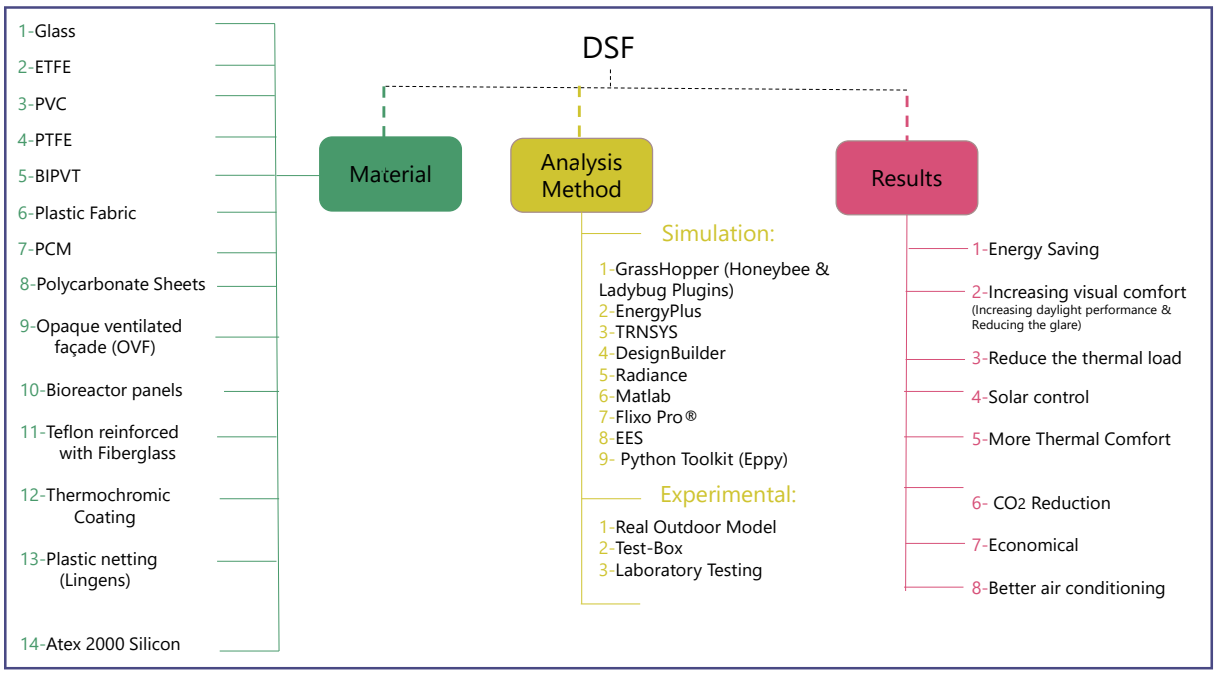

Fig 1. Schematic on the main findings from the review, highlighting the investigated materials, the methods of analysis, and the main results of each research/case study.

4. Conclusion

Several energy-efficient measures have been proposed and analyzed for transparent and opaque building envelopes by several research studies around the world. They generally suggest integrating high-tech solutions such as Second Skin facades, fabric materials, building-integrated photovoltaic panels, and responsive building elements. The results show that these approaches can improve the efficiency and the thermal properties of buildings, decreasing their energy consumption and polluting emissions, positively affecting global and local warming. However, there are limitations to each strategy and possible future developments to consider, mainly the SSF's overheating in some seasons or the the lack of studies on some materials (like plastic fabric, nets and woven materials), as well as a lack of numerical models able to simultaneously reproduce their behavior from different points of view (i.e. thermal and optical).
However, the results from the review, which analysed also studies in different climatic conditions, highlight a big potential in the SSF systems and the opportunity for investigating new outer layer material, as well as new integration and control logics.

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A research on thermal defects in building envelopes for mid-rise houses to develop retrofit strategies: a case study in Sivas/Turkey

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Abstract

Due to the developing society, increasing population which caused the increase in urban settlement brought forward the production of multi-storey houses with a considerable amount in the last century. Considering the increasing energy costs, the limitation of fossil fuel resources and the environmental pollution, the studies on the houses, which constitute 80% of the total building stock, have boosted. In this context, it is important to increase the energy efficiency of the existing building stock and to provide today's energy standards. For this purpose, maintenance, improvements, renovations and retrofits should be carried out on the building envelopes of existing buildings. With the research, it is aimed to contribute to the determination of retrofit strategies by revealing the thermal defects regarding the heat losses in the building envelope of the existing medium-height residential blocks in Sivas, which is located in the cold climate zone of Turkey. For this purpose, housing blocks in Yenişehir region of Sivas province were examined and analysis made with the help of thermal camera are revealed.

Keywords

Thermal Performance, Retrofit Strategies, Mid-Rise Residences, Building Envelope, Thermal Camera

1. Introduction

In the housing sector, a significant part of the energy is consumed through construction and operation. In 2020, global building's construction and operations, together accounting for 36% of global energy consumption; and also accounted for 37% of energy and process-related carbon dioxide (CO2) emissions (IEA, 2021). According to IEA data, the housing sector in the world consumes 54% of fossil fuels as primary energy. Due to the possibility that the secondary fuels used are of fossil origin, most of the energy used in residences is of fossil origin and harmful to the environment (IEA, 2019). Approximately 21% of the annual primary energy supply in Turkey is used in housing sector (MENR/GDEA, 2019). In addition, since Turkey is a country which imports energy, the economic perspective of the problem should also be mentioned. Due to the climatic conditions of Turkey, measures should be taken to minimize long-term and high-cost heating costs. In most of the existing buildings, the measures taken against this problem are limited or insufficient.

2. Aim and Scope

The primary aim of the research is to contribute to the prevention of global warming and climate change by reducing the negative environmental effects caused by high energy consumption in existing buildings. It is aimed to provide energy efficiency and economic savings related which can be achieved within building envelope of existing buildings. Observations were made in a region that typically represents the common features of the existing mid-rise housing stock of Sivas.

The envelopes of the buildings in the research were observed with thermal camera to detect thermal defects. Thermal defects that cause heat loss in the winter times on the examined structures is reported. Classification of defects are reported with a table.

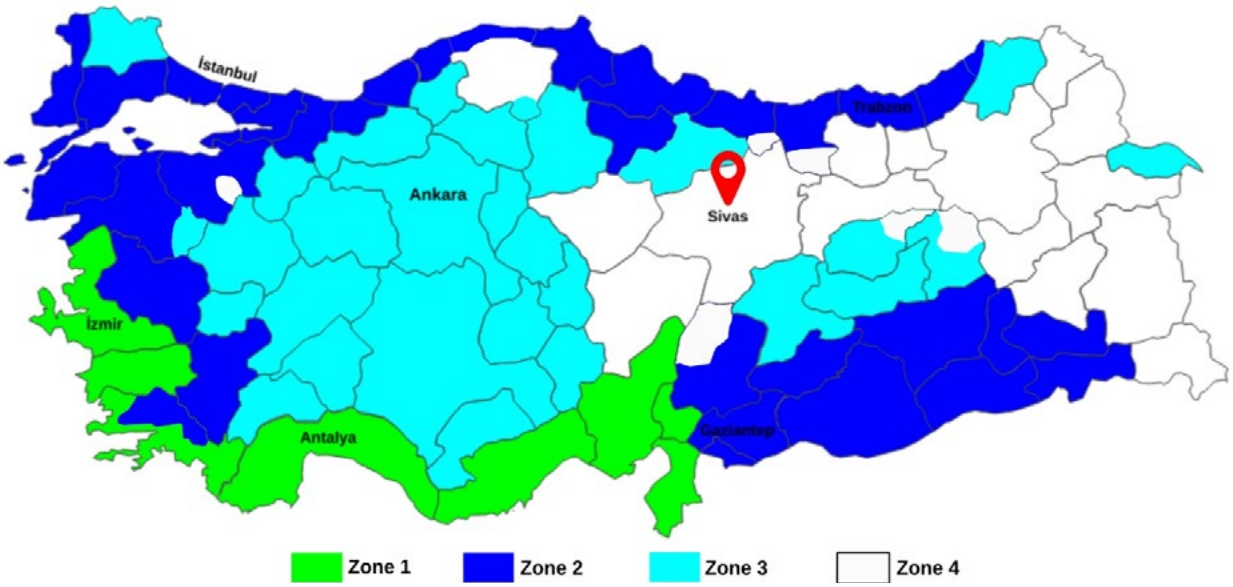


Fig 1. Different climate zones in Turkey (TS 825, 2008)

3. Context

Sivas was chosen as the research location since it is listed in 4th climatic region in Turkey based on TS825 (Turkish Standard related to thermal insulation for buildings) due to degree day approach [Fig 1]. With the research, it is aimed to determine the energy performance of the existing housing stock in a cold region, to compare with current energy targets and to determine retrofit strategies in the context of current regulations. The thermal defects of mid-rise houses up to 5-7 floors are examined in detail.

4. Literature Review

The research conducted by Basirir and Diri in 2014, 5 different retrofit strategies were classified namely; demolition and rebuilding of the facade, application of shell on the outer surface of the facade, application of shell on the inner surface of the facade, adding new layers to the exterior surface of the facade, adding new layers to the inner surface of the facade according. In the study of Xu et al. (2021), an evaluation matrix for the building envelope of the existing buildings in the cold regions of China were developed. Konstatinou (2014) has proposed a matrix system that includes building envelope layers and applications that will assist in formulating a strategy for retrofits.

Kamel and Memari (2016) claimed that, use of airgel on walls and floors provides up to 11.3% energy savings, while the application of R-15 XPS provides up to 10.8% energy savings. However, it has also been revealed that airgel will increase the construction cost by 63% and XPS by 2.3%. In a study conducted by Thomsen et al. in Denmark (2016), 35% heating energy gain was achieved as a result of extensive improvements in an apartment block located in a cold climate zone. Kilinc (2011), evaluated heat transmission coefficients by applying 12 types of different wall models in a building located in Sivas.

5. Method (Case Study)

The buildings were examined with thermal camera (Testo 875-1i) images in February 2021, when the heating loads were high, and errors that could cause energy loss in the building envelopes were found. As an outcome, types and directions of interventions for errors of building envelope were determined[Fig.2].

Researched midrise houses located in Yenişehir region of Sivas, were built in the early years of 1990s. However, heating insulations are applied between years 2010-2018. Although most of the

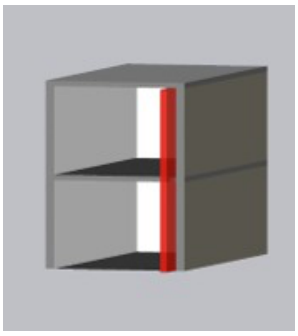
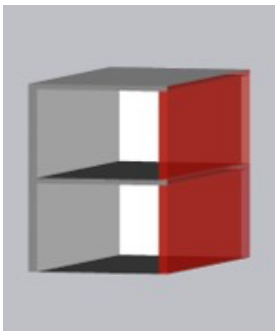
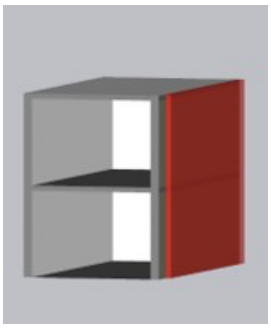
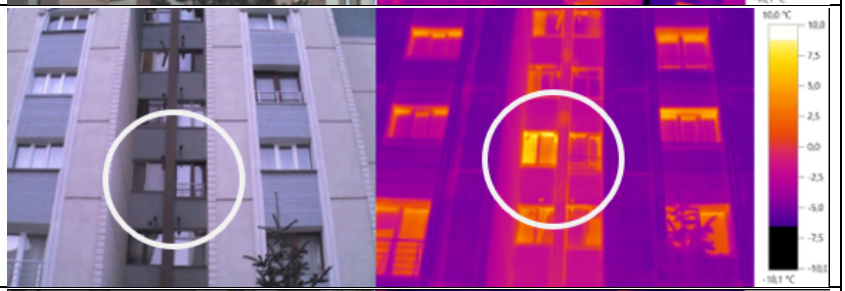
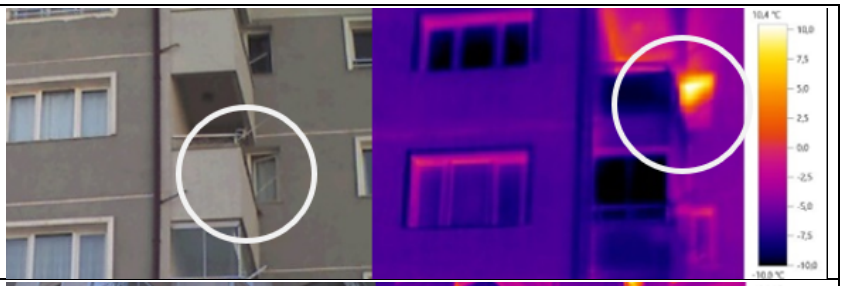
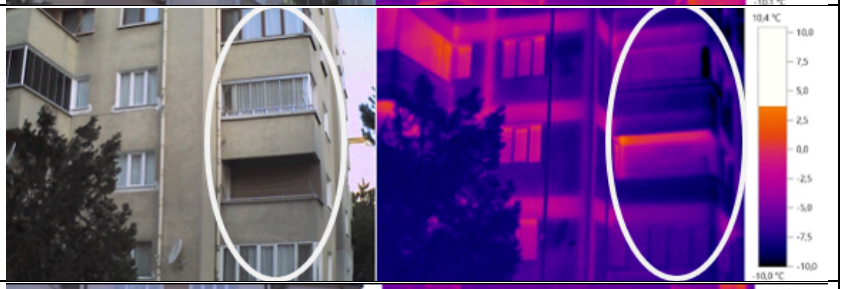
Types of intervention		
From Inner side of Building Envelope (BEI)	Directly through Building Envelope (BED)	From Outer side of Building Envelope (BEO)
		

Fig. 2. Types and directions of interventions for errors of building envelope

Tab I. Detection and classification of heat losses in investigated buildings with thermal camera (Testo 875-1i).

Types of Thermal Defects in Observed Buildings		
Numbers and types of intervention	**Types of heat loss**	**Defects with thermal camera images**
1 BEO	Heat loss from open balconies and balcony flooring	
2 BED	Heat loss from window frames	
3 BEO BEI	Heat loss due to use of materials with insufficient thickness and transmittance values	

4 BEI	Heat loss from windows opened by the user to provide internal ventilation	
5 BEO	Combining the closed balcony sections with the interior volumes	
6 BEI BED BEO	Not using equal and enough heat insulation in each flat	
7 BED	Changing opening/wall ratio on the northern façade of the building	
8 BEO	Unapplied external insulation materials on closed balcony walls	
9 BEO BEI	Observation of structural system and wall components with different heat transfer levels due to the non-insulated façade.	

10 BEI	Different internal temperature values preferred by residents in buildings without central heating system	

blocks were insulated, there are still 3 blocks without any heating insulation applied. Observed common thermal defects and potential intervene types are discussed in Table I with thermal and real images.

6. Discussion

Observed defects can be classified as: Defects related to construction, defects related to misusage of occupants, defects related to wrong material choice, defects related to poor detailing. Most of the balconies and window attachments to walls are not properly insulated. Materials used for framing windows and glass types used are not well chosen. Replacing existing windows with the new ones with bigger surface area was not detailed. Details are not designed well enough to avoid thermal bridges. Material misusages and poor detailing is also frequently observed. Different ventilation habits of different occupants also noticed as one of the reasons of heat loss in daytime. Different retrofit strategies should be developed based on the outcomes reported. Interventions on the building envelope should also be an important factor for developing retrofit strategies.

7. Conclusion

In this research, mid-rise housing blocks with high heating load, located in Sivas is analysed. Thermal camera images used to classify thermal defects in the building envelope with their interventions. Based on the analysis thermal defects are caused by several reasons in different parts of building envelope are categorized. It is expected to develop retrofit strategies considering the problems stated. For this purpose, as a future work, it is intended to run real time energy simulations with different retrofit precautions. With the outcomes of simulations, it is expected to define exact retrofit strategies for different problems defined in the text.

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Review of 3D Printing in Architecture: applications, limitations and future developments

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Abstract

Additive manufacturing has seen a growing interest in the construction industry in the last few years. Along with the possibility of using plastics, cement, clay, mixtures, and so many other materials, the opportunities offered by such technologies mainly rely on the free-shaping of complex geometries and the high customizability of the products. Nowadays, the aim of integrating additive manufacturing processes in the construction stages is to reduce waste materials and reduce the overall environmental impact. This review summarizes the current state-of-art of additive manufacturing, mainly 3D printing, applied to architecture, in current research activities, and actual built projects. The aim is to delineate a comprehensive scenario of its possible applications and current limitations, finally suggesting the opportunities for future investigations.

Keywords

Additive Manufacturing, sustainable architecture, optimized building components, façade module, 3D printed buildings

1. Introduction

As the building sector currently accounts for more than a third of the global energy consumption and greenhouse gas emissions (European Commission, 2019; Rousselot & Pinto Da Rocha, 2021), new materials and systems are constantly developed to improve the buildings' performances (Agarwal & Gupta, 2017; Krivoshapko, 2018; Moradibistouni et al., 2020; Trubiano, 2013). Some technologies could help bridging the gap between components and building design, while also providing for an intermediate step between conventional and highly customized/adaptive techniques. Additive Manufacturing (AM), such as 3D printing, seems to be one of the most promising technologies due to its adaptability as well as the easy deployment and integration in different steps of the construction stages (Dixit, 2019; Gerbert et al., 2016; Pessoa et al., 2021; Pessoa & Guimarães, 2020). In this work, a brief review is carried out, to define the potentialities and current limitations of such technology and highlight the examples in realized projects.

2. State of the art

In order to investigate state of the art, an analysis was carried out on the Scopus database for academic journals and the main architecture websites for the built projects with particular attention to the following keywords: "building additive manufacturing", "3D printed buildings", "3D Printing Architecture", "sustainable constructions". The reference period was limited to the last seven years.

3D printing provides two key advantages over conventional methods: geometric freedom and no requirement for specialized tools. There are numerous, well-established 3D printing processes with different baseline technologies (laser, jet-printer, or extrusion) and different types of raw material input (liquid polymers, discrete particles, molten materials, or solid sheets). The most prevalent processes in

Tab I. Available 3D printing technologies.

3D Printing technology	Fused Filament Fabrication (FFF)	Direct Metal Laser Sintering (DMLS)	Binder Jetting Printing (BJP)	Extrusion-Based Concrete (EBConcrete 3D)	Extrusion-Based Clay (EBClay 3D)
Year	1989	1994	1993	2004	2013
Materials	plastic/ polymer/ metal filaments	metallic powder	granular sands/ ceramics/ metals	uncured cement mortar	uncured clay mortar
Use in construction	+++	+	++	+++++	++
Detail	++	+++++	+++++	+++	+++
Waste recyclability	+	+++++	+++++	+++	+++
Prints size	++	+	++++	+++++	++
Printing speed	+++	+	++++	+++	+
Costs during printing phase	++	+++	+	++	++

+: very low; +++++: very high

(liquid polymers, discrete particles, molten materials, or solid sheets). The most prevalent processes in the field of architecture (Bechthold, 2013; Campbell et al., 2021; Clevenger & Khan, 2014; Goldman & Zarzycki, 2015; Kensek & Noble, 2014; Khoshnevis, 2004) are reported in [tab. I].

In order to assess the opportunities and limitations of such technologies, this review analyses the broader spectrum of both scientific case studies and architecture projects.

The scientific literature review has been organized to assess the current progress at different AM stages and scales (component design, size and function, full-scale prototypes and modules, and devices), following the shift towards the *design for function* paradigm, instead of the current *design for production*.

In (Nadal et al., 2017), the authors present a methodology to optimize the use of material during the production of 3D printed building components to account for the current lack of standardization in the AM manufacturing process, developing an optimizer plug-in for the software, Rhinoceros.

At the next stage, both (Singh et al., 2022) and (van den Heever et al., 2022) studied the feasibility and structural resistance of 3D printed concrete specimens reinforced with in-laid or mixed fibers. These studies highlight the importance of the orientation of the printing layers and reinforcing fibers, which must be perpendicular to the stress direction, as well as the number of fibers in the mixture.

Then, (Sangiorgio et al., 2022) and (de Rubeis, 2022) studied the opportunities from 3D printed bricks, both in clay and PLA, in terms of production scalability and thermal performances in integration with conventional insulation materials.

In particular, (Sangiorgio et al., 2022) reported, among 18 prototypes, the Diamond infill geometry as the optimal design in terms of minimal surface, printability and resistance of the bricks, and (de Rubeis, 2022) measured their thermal performances (i.e. thermal transmittance value = 0.78 $Wm^{-2}K^{-1}$). While these results may still be far from conventional materials, they show the importance of a proper design and optimization of the internal geometries.

This topic has also been covered by (Alghamdi & Neithalath, 2019) and (Liu et al., 2022), which assessed the performances of 3D printed foam concrete. Their studies showed the best results from the specimens with a foam porosity ranging between 55 and 75%, achieving a thermal conductivity value range of about 0.8~ 1.0 $Wm^{-1}K^{-1}$ and a high production reliability.

Several studies focused on developing full-scale prototypes of whole façades or façade modules, in both concrete (Ayegba et al., 2022; Volpe et al., 2021) and plastic materials (Guerguis et al., 2017; Sarakinioti et al., 2018; Taseva et al., 2020). The focus of these studies was mainly on the design and optimization of the prototypes, which could be effectively deployed and used in different building scenarios. In particular, (Ayegba et al., 2022) carried out a numerical analysis on the indoor thermal comfort and environmental impact of 3D printed concrete envelopes, while in (Volpe et al., 2021) the authors developed and tested a façade module [fig. 1a], to be integrated with conventional insulation materials, construction components and techniques. Both studies report significant advantages of the 3D printed components compared to conventional systems, allowing for better energy and

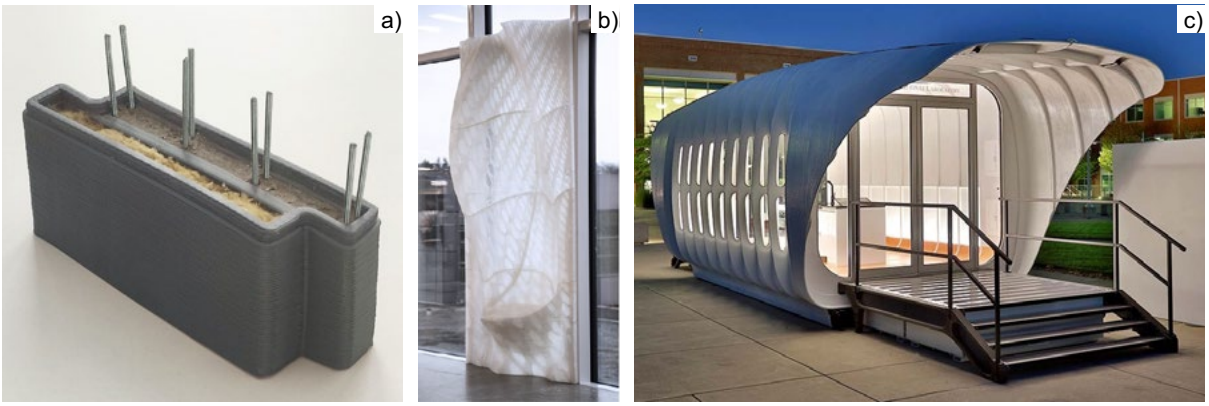

Fig 1. Photos of a) the module by (Volpe et al., 2021), b) the large size module by (Taseva et al., 2020), and c) the building prototype by (Guerguis et al., 2017)

3D printed components compared to conventional systems, allowing for better energy and environmental performances at all the stages of the construction process.
A similar approach was adopted by (Sarakinioti et al., 2018) and (Taseva et al., 2020), where the authors developed and tested different prototypes of façade modules in PETG and PLA, respectively. As shown in [fig. 1b], using 3D printing and a proper design methodology, it is possible to fabricate complex free-form envelope shapes, fully exploiting the material's properties.
Finally, (Guerguis et al., 2017) reported the design, optimization and printing stages of a full-scale 3D printed building [fig. 1c], highlighting the advantages of combining an innovative construction process with conventional components.
In [tab. II], a summary of the scientific references is reported.
The architecture projects review has been carried out considering the main international exhibitions and websites associated with the architecture and design worlds.
An overview of the architecture projects investigated in this research is provided by [fig. 2].
The first two projects (AIRLAB, 2018, 2019) investigated the optimization possibilities of designing and manufacturing non-standard load-bearing components using 3D printing. Two different 3D printing technology (BJP and FFF, respectively) and two different materials (steel-bronze and PLA, respectively) were used. In particular, *AirMesh* [fig. 2a] was designed as a temporary pavilion in the Gardens by the Bay Singapore (AIRLAB, 2019), while the *Sombra Verde* project [fig. 2b] was exhibited at Singapore's Urban Design Festival in 2018 (AIRLAB, 2018).
In another project, *Timescapes* [fig. 2c], the 10th anniversary pavilion for Singapore University of Technology and Design (AIRLAB, 2020), the 4037 3D printed tiles (in PLA) were fixed to a plywood structure to realize an evocative space inside the university main hall.
On a bigger scale, in 2015, the Lab3D designers (Lab3D, 2015) developed and printed in PLA a lightweight and energy efficient façade module [fig. 2d], designed to offer improved insulation performances compared to conventional construction solutions.
Then, two projects show a deployment on a whole-façade scale in Munich [fig. 2e] and Amsterdam [fig. 2f]. In Munich, the 3F Studio's architects designed a temporary 3D printed entrance for the Deutsches Museum TUM (3F Studio, 2019), modifying the riverside façade of the historical museum building. In Amsterdam, the façade designed by DUS (DUS architects, 2016) for the Dutch EU Presidency in 2016 provided an unconventional shell for the whole presidency building, promoting the low-environmental impact of PLA and 3D printing technology, as well as the opportunities of such technology in free shaping and quickly deploy complex façade systems.
Finally, the last three projects show a full-scale application of 3D printing technologies in clay [fig. 1g] and concrete [fig. 2h-i].
In the first case, the collaboration between Cucinella Studio and WASP allowed to design and build two clay domes, which compose a biodegradable habitat prototype (Mario Cucinella Architects, 2021).
The last two cases explore the feasibility of deploying 3D printed concrete structures, highlighting the short construction times as well as low capital cost and environmental impact in the construction stages (ICON, 2020; WinSun Decoration Design Engineering, 2015).

Tab II. Summary of the investigated scientific literature.

Ref	Tech	Material	Aim	Details	Variables	Results
(Nadal et al., 2017)	FFF	FFF compatible materials	Optimization of 3D printing process	Optimization of 3D printed structures in order to reduce waste material and printing times	Structure optimization; Printing time	Software optimizer for Rhinoceros; Prototype (0.4 × 0.4 × 1.5 m)
(Singh et al., 2022)	EBConcrete	Concrete	3D printed concrete specimens	Effect of steel fibers integration under different loading orientations	Printability; Structural resistance upon varying load orientation	Highest compressive strength at 90° loading for the 0.75% mixture
(van den Heever et al., 2022)	EBConcrete	Concrete	Reinforced 3D printed structural elements	Experimental and numerical assessment of the mechanical performance of reinforced 3D printed concrete deep beams with hollow cross-sections	Structural resistance; Numerical model reliability	Need for vertical reinforcement; 14% deviation between experimental and numerical results
(Sangiorgio et al., 2022)	EBClay	Clay	3D-printed clay bricks	3D-printed clay bricks for building construction with complex internal geometries based on minimal surfaces	Infill geometries; Structural resistance	Validation of the printability and resilience of different infill geometries
(de Rubeis, 2022)	FFF	PLA	3D printed bricks	Design and fabrication of 3D printed brick integrating recycled insulation materials	Thermal transmittance	Thermal transmittance value of the prototype: 0.78 $Wm^{-2}K^{-1}$ ± 3.05%
(Alghamdi & Neithalath, 2019)	EBConcrete	Cementitious paste	3D printed cementitious foam	Insulation for conventional hollow bricks, with high fire resistance and low environmental impact	Stability; Porosity; Thermal conductivity	Prototypes: shear yield stress 60~ 130 Pa; porosity 55~ 75%; th. cond. 0.8~ 1.0 $Wm^{-1}K^{-1}$
(Liu et al., 2022)	EBConcrete	Cementitious paste	3D printed cementitious foam	Effects of integrating sulphoaluminate cement in foaming concrete mixtures	Printability; Stability; Structural resistance	Definition of the ideal sulphoaluminate cement ratio: 10%
(Ayegba et al., 2022)	EBConcrete	Concrete	3D printable building envelope	Integration between 3D printed concrete walls and traditional components	Energy efficiency; Carbon emissions; Thermal comfort	Optimization methodology of the numerical models
(Volpe et al., 2021)	EBConcrete	Concrete	3D printable building envelope	Design and fabrication of precast 3D printed concrete building envelope	Sustainability; Printing optimization; Structural resistance; Thermal performances	Prototypes: Reusability, modularity and recyclability; Integrability with conventional insulation materials; Good thermal transmittance values: 0.25~ 0.26 $Wm^{-2}K^{-1}$
(Sarakinioti et al., 2018)	FFF	PLA & PETG	3D printed façade module	Design and fabrication of 3D printed modules with heat storage capabilities	Infill geometries; Thermal conductivity	Prototypes, with thermal conductivity values ranging 0.09~ 0.1 $Wm^{-1}K^{-1}$
(Taseva et al., 2020)	FFF	PLA	3D printed façade module	Concept and optimization of the infill and on-site assembly of a 3D printed façade module.	Infill geometries; Structure discretization; Connection	Prototype
(Guerguis et al., 2017)	FFF	Carbon fiber-reinforced ABS composite	3D printed building envelope	Design of highly customized and high-performance building components	Resistance; Compatibility with standard components	Building shell prototype

Fig 2. Architecture projects investigated in this research: a) AirMesh, b) Sombra Verde, c) Timescapes, d) Lab3D façade module, e) 3D Printed Façade installed at the entrance to the Deutsches Museum TUM, f) 3D-printed façades installed on the Europe Building for the Dutch EU Presidency in 2016, g) TECLA prototype by Cucinella Studio and WASP, h) 3D printed building by WinSun Studio, and i) Community First! Village by ICON (3F Studio, 2019; AIRLAB, 2018, 2019, 2020; DUS architects, 2016; ICON, 2020; Lab3D, 2015; Mario Cucinella Architects, 2021; WinSun Decoration Design Engineering, 2015)

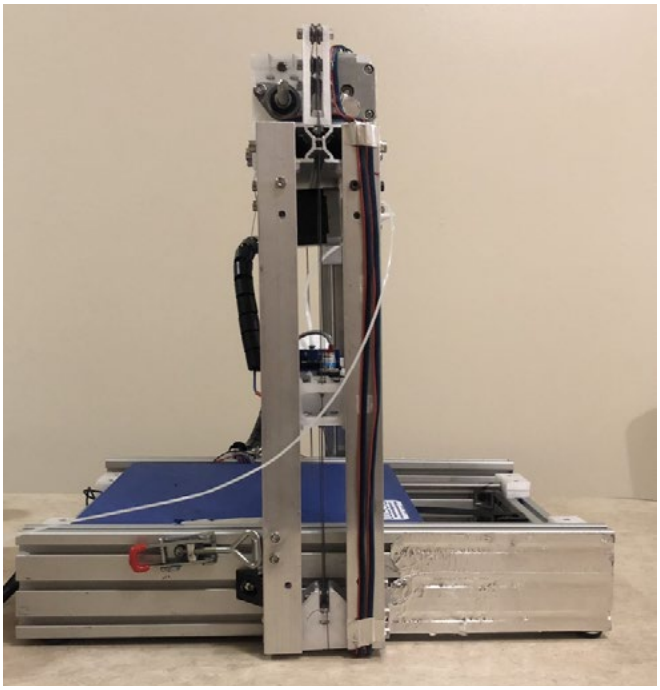

Fig 3. New 3D printer prototype for deployment in harsh and emergency scenarios (Lipsky et al., 2019)

3. Results and discussion

As stated by (Strauß & Knaack, 2016), AM is a promising technology to new approaches in building design and construction. As shown in this review, using AM, the building components can be rapidly manufactured on-site, customizing and optimizing every part, and cost and production time are no longer tied to the part's complexity (Hansmeyer & Dillenburger, 2017).
Limitations still stand, but they are being overcome by the advances in technologies and their broader adoption.
Furthermore, 3D printing shows promising opportunities also in the humanitarian and emergency supply chain. As discussed by (Lipsky et al., 2019), 3D printing would allow for easier and lighter deployment of supplies and spare parts. However, at the current state, the 3D printers have a strict set of requirements to function correctly, mainly concerning portability, durability, and energy supply. In order to overcome these shortcomings, (Lipsky et al., 2019) proposed a new model of 3D printers, specifically designed to withstand harsh scenarios, effectively expanding the capabilities of humanitarian organizations [fig. 3].

4. Conclusions

This review summarizes the current state-of-art of AM integration in the building sector. The results of the investigated research activities and architecture projects return a scenario where the opportunities offered by such technology are already quite well-expressed, in terms of energy performances, thermal characteristics, and environmental and architectural impact. The opportunities for further investigations and testing are constantly growing, following the developments of new building design and the availability of new printable materials. Further activities may concern the design of new components, new optimization methodologies, the integration on real case studies and the development of new tools to predict the behavior of such complex systems.

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From climate change to the development of adaptive building envelope

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Abstract

To respond to climate and energy issues, to build a new generation of high environmental quality buildings, a major challenge is the development of adaptive and responsive envelopes capable of reversible and controllable adaptation to climate change stresses. The contribution refers to a research in progress, whose objective is the definition of an adaptive model for envelope systems, able to transform the envelope element from static to dynamic. The investigation conducted through experimental laboratory evaluations will provide the formulation of solutions to realise an adaptive envelope that improves the overall performance through new technological strategies. It seems clear that the definition of new design strategies aims at the evolution of a responsibly controlled built environment, capable of dealing with the complex dimensions of design and technological culture that is needed now more than ever.

Keywords

climate change, building envelope, adaptive model, technological innovation, testing

1. Introduction

The effects of climate change (IPCC, 2021) have negatively affected the performance quality of the built environment, highlighting the need to define operational actions and measurable responses aimed at mitigating impacts. The challenge is implemented on the ability to adapt to changing climatic conditions that, in the Mediterranean area (Gaertner et alii, 2018), are characterized by increasingly frequent extreme events such as rising temperatures, resulting in heatwaves, water bombs, and *Medicane* (cyclones formed in the Mediterranean) [fig. 1]. These phenomena represent a critical point for the building envelope, especially on curtain wall systems (UNI EN 13830:2020). In literature, there are limited studies on the long-term performance of curtain wall systems; recent studies indicate that thermal effect and air and water infiltration are the most significant problems for these buildings (Yalaz et alii, 2016).

Innovative approaches such as the *Adaptive Façade System* (Attia et alii, 2020) could play a role in the future, as their adaptive behaviour could optimize the responsiveness of building envelopes to varying external and internal conditions. Recently, trends in the design of envelope systems, particularly the façade, have evolved using dynamic systems with the adoption of layered façades; each layer functions according to a specific task and their combination represents a complex system (Fiorito et alii, 2016). However, the application of adaptive envelope technologies is limited to individual cases of architectural design due to the lack of benchmarks, standards, and testing procedures for verifying the performance of adaptive building envelopes (Borkowski et alii, 2021).

The study refers to research in progress to direct a new method of investigation and measurement that relates the performance of buildings to the effects of climatic phenomena. The objective of the research is the definition of an adaptive model for building envelopes, with the use of innovative materials intended as a technological strategy able to react to specific contextual conditions in the Mediterranean area. The research aims to investigate the issues related to the concept of adaptive reaction of the

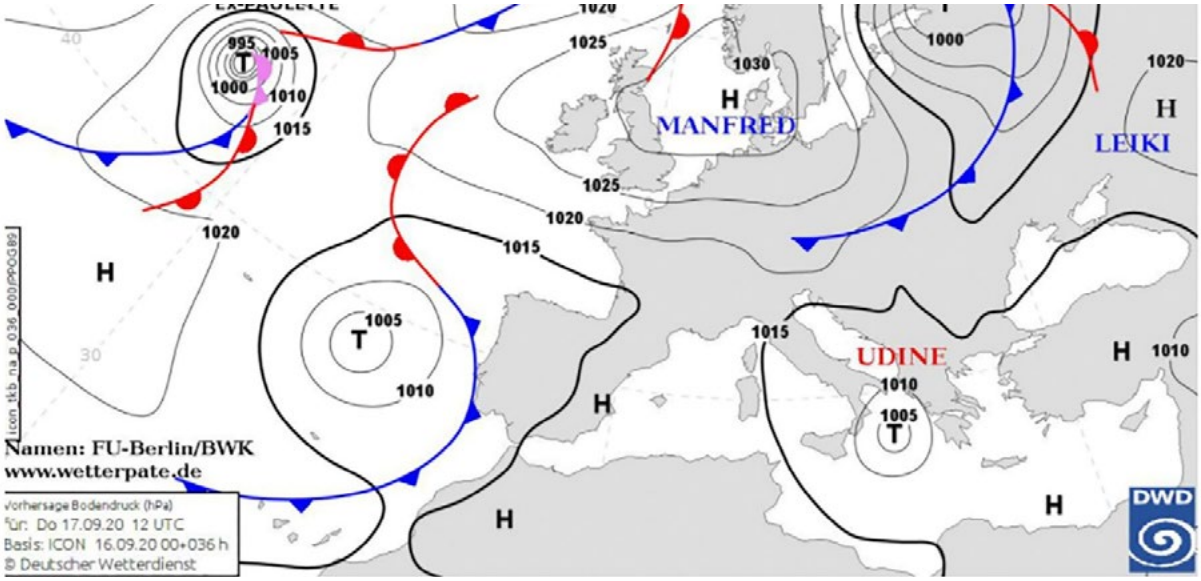

Fig 1. Mediterranean cyclone UDINE. (Map Berlin-Dahlem Meteorological Institute, 2020)

area. The research aims to investigate the issues related to the concept of adaptive reaction of the building envelope, which implies transformations that improve building performance such as thermal, visual, and acoustic comfort (Aresta, 2018) to continuously changing external stresses.
A strong point of the experimental analysis is the support of specialized laboratories for advanced testing of building envelopes. The instruments reproduce climatic stresses on mock-up, to measure their performance response and adaptive characteristics. It is possible to configure and test different scenarios of model adaptability, orienting design decisions towards the most congruent options for different reference contexts.

2. Methodology

The research adopts a deductive, systemic and scalar methodological model that allows structuring of the activities for consequential moments of analysis.
The first phase concerns the analysis of extreme events due to climate change (increase in temperature, precipitation, and wind speed in the Mediterranean area) and the study of the characteristics of materials, systems, and technologies for the envelope, able to adapt to the above climatic stresses. This dynamism allows the building to adapt to what happens to its exterior with a cause-effect relationship. These materials can be engineered at the molecular level to respond to inputs such as light photons, temperature differences, chemicals, magnetic fields, or electricity (Zarzycki & Decker, 2019). The use of innovative materials also determines a different design approach: the material is designed in such a way as to make it suitable to guarantee the required performance and not already verified a-posteriori, depending on the demands and needs (Mandaglio, 2014). Subsequently, a critical analysis was carried out on the problematic aspects and the most recurrent deficits of curtain walls to solve the criticalities through the design of an adaptive model.
The second phase is the feasibility check to develop the adaptive model to propose new replicable solutions of adaptive components for building envelopes. The model must have the possibility to vary geometric configuration and thermo-hygrometric performance to the environmental climatic micro-context (Merlier & alii, 2019).
The last phase concerns the performance verification of the model applied to a curtain wall system (1:1 scale mock-up) through testing actions using specific equipment and machinery to standardized protocols. The adaptive model will be studied in its characteristics of air permeability and watertightness in static and dynamic conditions to simulate real environmental conditions, such as heatwaves and water bombs.
The following test methodology is identified for future testing activity:
- Heatwaves: Air permeability (ASTM E 283-04, 2012), consists of the measurement of the air

- Heatwaves: Air permeability (ASTM E 283-04, 2012), consists of the measurement of the air permeability of the sample, subjected to positive/negative differential pressures (6.24 lbf/ft², 299 pascals);
- Pluvial flooding: experimentation will be carried out by simulating three scenarios. a) In the absence of wind: Watertightness performance under static pressure (ASTM E 331-00, 2009) consists of a constant and uniform amount of water (=3.4 l/min m2) applied through a sprinkler system to the outer surface of the sample and the simultaneous application of a static test pressure of 12psf [fig. 2]; b) In the presence of wind: Watertightness performance under dynamic conditions (AAMA 501.1-05-00, 2007) consists of a constant and uniform amount of water (= 3.4 l/min m2) on the external surface of the mock-up and the simultaneous application of a dynamic pressure of 31.5 psf, for a time of 15 minutes; c) under extreme wind conditions: Structural performance (ASTM E 330-02, 2010), applies positive and negative test pressures of 50% and 100% of the design wind load, for which measurements and checks are made to verify that, under these effects, the mock-up presents a permissible deformation, preserves its properties and allows the safety of users.
The final phase of the research concerns the results elaboration of the tests carried out with the ultimate aim of elaborating and updating test protocols, both for subsequent experimental activities and for certification in the regulatory framework.

3. Expected results

The ambition of this study is to improve the performance of curtain walls by reducing the impacts resulting from extreme events of climate change with the development of an adaptive model - the result of the research - able to react synergistically to different climatic conditions. In climate change situations, the study of the real behaviour of curtain walls guides the configuration of new adaptive scenarios, directing design decisions toward the optimal option to different reference contexts.
According to the consequential steps and objectives of the research, the expected results are listed below:
- systematization of data on extreme events in the Mediterranean area;
- elaboration of critical repertoires on materials, systems, and adaptive technologies to guide the choice of the material to the climatic conditions studied;
- elaboration of performance repertoires on possible deficits of curtain walls to extreme events to orientate the adaptive configuration of the model;
- definition and development of the adaptive model capable of responding positively to the heatwaves and pluvial flooding conditions;
- testing and verification of the adaptive behaviour of the model applied on a curtain wall for its performance improvement in a specialized test laboratory, and under standardized test protocols.
The instrumental and operative opportunity of research, in the different scientific aspects, is concretized in the strategic possibility of supporting the forecast of the expected results - or to better calibrate the adaptive configuration of the model - through particular conditions able to read in advance future outcomes, then enrich the process of a new ability to control performance dynamics.
In this sense, the main requirement for advanced transparent façades will be their adaptability, as the façade becomes a fundamental part of the climate concept (Andreotti, 2003).

4. Conclusions

The research aims to respond to the challenges identified by different sides of the scientific debate in recent decades, where there is an increasing need to develop innovative building envelopes, but whose performance response is undeniably linked to the variables related to the environmental conditions with which they relate.
Therefore, this research, although still ongoing, is oriented towards the design of the optimal combination of the adaptive model, focusing on the most appropriate and calibrated adaptation efficiency with respect to specific environmental contexts. Factors such as façade size, orientation, and position are considered influential in improving indoor environmental performance and the amount of energy consumed in the envelopes (Hassan, 2020).
One of the innovative aspects of the research is to conduct full-scale tests, adopting heatwaves and pluvial flooding test methodology under specific climatic conditions. As an extension of this study,

Fig 2. Water bomb test on curtain wall, according to ASTM E331-00 (2009). (Credit: Martino Milardi, 2020)

laboratory tests on curtain wall types can be conducted on the basis of the proposed test procedure. Studies on the choice of the most appropriate material and the configuration of the adaptive model are still in progress [fig. 3], promoting the realization of innovative products addressing the market trends for adaptive envelopes.

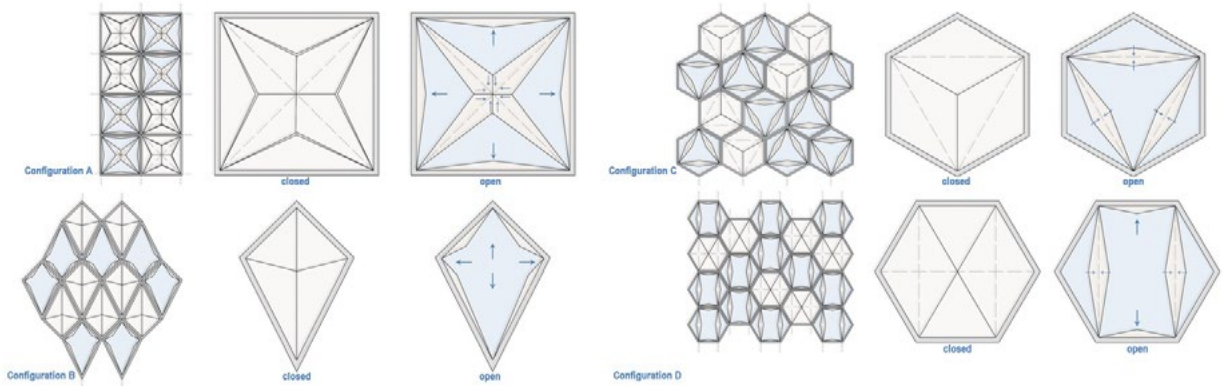

Fig 3. Possible configurations of the adaptive model. (Graphic elaboration by Evelyn Grillo, 2022)

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Advanced manufacturing processes for emergent architectural systems

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Abstract

Advanced manufacturing processes for emergent architectural systems quests to disentangle the critical interdependencies between materials, manufacturing, and design process involving the use of digital additive manufacturing technologies at an architectural scale. The focus implies the analysis of the strategic aspects leading towards a more sustainable construction process in terms of resources, time, and materials. Computational design tools and 3D printing technologies, toward simulation and optimization, prove to strongly affect the way we populate and design our built environment. CAD and CAM technologies offer a significant range of implemented solutions able to support the emergence of original formal archetypes and innovative construction systems that embrace more resilient building processes. From these premises, the study aims to focus on the principal tools and techniques in support of large-scale 3D printing as novel technology associated with potentially strong stimuli for sustainable development.

Keywords

Advanced Manufacturing, Large-Scale 3D Printing, Sustainable Development, Optimization, Process

1. 3D Printing architecture

Digital fabrication technologies have radically transformed the relationship between the design process and construction systems. Thanks to the use of digital modeling and simulation tools, designers and architects acquired the ability able to gain direct control of the whole design and building process. "Integrating computer-aided design with computer-aided fabrication and construction [...] fundamentally redefines the relationship between designing and producing. It eliminates many geometric constraints imposed by traditional drawing and production processes—reducing dependence on standard, mass-produced components." - W. Mitchell and M. McCullough in Digital Design Media (2018). The term Digital Fabrication refers to the process by which three-dimensional digital models can be materialized and prototyped with additive, subtractive advanced robotic manufacturing tools. 3D printing for construction instead refers to a heterogeneous class and commonly refers to all those technologies that use additive manufacturing through robotic systems as a fundamental method to realize buildings or construction components. Thanks to the development of new generations of robotic systems with the ability to perceive space, it is now possible for humans and robots to collaborate in uncontrolled construction sites. "Robotic manufacturing will enable us to eliminate the loss in translation from data to matter and allow us to fabricate homes at great speed, with less waste, and with higher accuracy than today," (Ingels, BIG, 2020) [Fig.1]. Among the numerous advantages, advanced manufacturing tools, like 3D printing, drastically reduce the time of the construction, as well as transferring the data directly from digital models to machines, cutting human intervention mistakes. Alongside with these advantages, the most evident benefits are the lower costs, the ability to manage greater complexity, ease of the construction process, achieve higher precision, and better integration of functions. On the other hand, the most crucial aspect that leads to a environmentally friendly construction processes are the drastic decrease of waste together with the use of raw materials with low embodied energy (Hager, Golonka, Putanowicz, 2016). The implications are vast, as "architecture is recasting itself, becoming in part an experimental investigation of topological geometries, partly a computational orchestration of robotic

Fig 1. ICON Vulcan 3D Printer created in partenrship with BIG Partners Up and 3D-Printing Robotics Company. Image source: © Regan Morton Photography

material production and partly a generative, kinematic sculpting of space, "as observed by Peter Zellner in "Hybrid Space" (1999).

2. Autonomous Robotic Construction Systems

Autonomous Robotic Construction Systems (ARCS), Large scale Additive Manufacturing (LSAM), and Freeform construction (FC) belong are the most relevant and spread methods that characterize additive 3D printing construction systems. As common features, they all include extrusion with the following materials, cement/concrete, wax, foam, polymer; powder bonding through the use of polymer bonding, reactive bonding, sintering, and additive welding. "One of the most driving factors for this growth is the spread of sustainable building projects. Companies are increasingly adopting 3D printing and low-impact methods to reduce construction costs and create energy-efficient buildings."(Grand View Research, July 2021).

The world's first production of construction printers was launched by SPECAVIA, based in Yaroslavl, Russia, in May 2015. The company managed to build a whole settlement with a cost of less than 400$ per square meter reducing construction time by 1.5 times compared to the traditional methods. The printer used has a build area of 3.5 x 3.6 x 1 meters and uses M-300 sand crete as printing material for the large structural sections of the building, with each layer measuring 10 mm high and 30 to 50 mm wide fabricating with a printing speed of up to 15 square meters per hour.

Companies are exploring and testing different approaches, XtreeE has developed a multi-component printing system, mounted on a 6-axis robotic arm. The project was launched in July 2015 with the construction of the first 3D printed house in Europe. The Building on Demand (BOD) project is a small office hotel in Copenhagen's Nordhavn area with fully printed walls and part of the foundations. The

Fig 2. Construction site of 3D Autonomous Robotic Construction System (ARCS). Image source: GPI HC Group.

research includes not only the configuration of hybrid robotic tools and innovative construction systems but also the creation of a new recipe of conglomerate materials able to be extruded. The concrete used for this project includes a large number of recycled tiles and sand, which makes the whole process environmentally friendly, demonstrating how 3D printing technology could be applied in the traditional construction industry in Europe. One of the building systems to have been most widely used is that used by SQ4D, a pioneer in the construction technology industry. In 2017, S-Squared 3D Printers Inc launched a new division, S-Squared 4D Commercial to build homes and commercial buildings with their 3D printing system called Autonomous Robotic Construction System (ARCS) [fig.2], technology to robotically build the footings, foundations, and interior and exterior walls on site of their homes. SQ4D's ARCS technology was initially unveiled in 2018 and has been described as being able to outperform traditional construction methods by reducing time and cost by up to 70% with the use of the Gantry system driving a lasting solution to the affordable housing crisis. The company says: “This revolutionary technology will be replacing and eliminating more expensive and inferior building materials, causing the printed structures to be stronger and safer. Utilizing concrete will reduce the cost by at least 30%, as well as make the structure more fire-resistant than traditional methods.”

3. Concrete-based 3D printing

Large-scale concrete-based 3D printing allows specific volumes of material to be precisely positioned, or solidified, in sequential layers using a computer-controlled positioning process. Three steps characterize the concrete printing process: data preparation from the digital model, compound preparation, and components printing. The generation of paths and data to enable the machine to position components or deposit material with given coordinates, order, and speed is made possible through digital simulation of the process, the use of specific software and design strategies appear essential to understand the relation between design and fabrication. It should not be forgotten that one of the relevant factors in being able to build from a simulation model is the vast amount of software that can optimize and verify the performance of geometries and materials, so as to obtain the most efficient possible structures with the least amount of materials. It is thus easy to realize maximally efficient filling such as honeycomb structures or space-filling curves no matter the geometrical complexity of the given pattern.

Fig 3. The HeidelbergCement research team is developing material formulations that can be used in various 3D printing techniques. Image source: GPI HC Group

4. Robotic conglomerate deposition process

The digital design process enabling the 3d printing fabrication process is the slicing of tridimensional models, which involves simulating the factorization of a three-dimensional object into flat layers with a constant thickness that can be deposited neatly on top of each other (Buswell, 2016). Each layer consists of an adimensional contour line and a filling pattern that can be developed for any different solution. The method of depositing concrete through the nozzle is the *tangential continuity*, whereby three-dimensional machine paths with locally variable thicknesses are created, thus generating constant contact surfaces between two layers, avoiding gaps between them, which have a negative effect on the cohesion of the artifact. After the determination of the actions related to the technological apparatus, the preparation phase of the construction material comes into play, the composition and the final consistency of the compound are factors of undeniable importance together with the coordination between the nozzle feed rate parameter and the flow rate of the extruded material. In the additive construction processes, in fact, fluidity and stability are crucial for the deposition and good hold of the architectural artifact. The general specifications for the creation of a suitable compound for the manufacture of 3D printed products in a workmanlike manner are: Pumping, Printability, Constructability, Useful time (Asprone, 2018).
Once the mixture with these properties has been tested, it is necessary to include it in the container through which it will be conveyed into the pump-tube-nozzle system that extrudes layers of self-compacting concrete, which will level layer by layer (Rael, 2011). Once the mix has been obtained and the material transport system has been activated, the distribution systems of the material on the site should be object of major attention. These systems are identified into two categories: gantry systems and systems using a robotic arm [fig. 3]. The former, the gantry system, operates an overhead-mounted manipulator to locate the print nozzle in Cartesian coordinates, while the latter provides additional degrees of freedom of the nozzle, enabling more complex and accurate. The gantry system operates through the *Contour Crafting method* (Khoshnevis, 2010) and involves depositing building material to create a large-scale 3D model with a smooth surface finish. Rails are installed around the ground of the building that will act as a structure to direct the robotic arm within which the concrete, layer by layer is depositated (Kolarevic, 2004).

5. The sustainable turn

The structural parts, developed with computational design tools and digital fabrication technologies, are loud-speaking examples of what can be achieved, pushing the boundaries of the hybrid design tools available for engineers, architects, and designers.
Through a reflective critique of the existing case study, this paper attempts to disentangle the critical interdependencies between the materials, manufacturing, and design processes tracing an overview of

the existing examples of constructions implying these specific processes. Although the value of automation to the industry deals with skilled labor shortages, the value of the architectural artifacts is still dictated by their quality, due to manufacturing precision, material performance, and optimization. “The 3D printing technologies, compared to traditional techniques of construction, could be considered as environmental friendly derivative giving almost unlimited possibilities for geometric complexity realizations.” (Hager I, Golonka A., Putanowicz R. 2016).

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09 Public policies for inclusive and sustainable cities

The environment: from limit to economic opportunity

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Abstract

The preservation of the environment requires, inextricably, the commitment of everyone - public and private subjects. The spectrum of the private contributions includes also all the behaviors spontaneously adopted to promote an increase in the environmental protection level. Some of these voluntary behaviors are based on parameters of economic convenience: the reference clearly goes to the environmental protection tools known as market-based tools. The greater environmental burdens are borne in view of the achievement of a direct or indirect economic advantage. Nevertheless, the environment seems to remain a limit, instead, to have an effective private contribution to the environmental protection, a radical change of perspective seems necessary. We therefore propose to evaluate the impact of the circular economy model on the contribution of individuals to environmental protection, which from a "limit to development" is increasingly turning into "development opportunities".

Keywords

environment, private contribution, circular economy, development, Green Deal.

1. Introduction: The contribution of private subjects to protect the environment

The environmental protection is not only a public interest, is the result of a plurality of "virtuous" behaviors on the part of all private and public subjects. The preservation of the environment requires, inextricably, the commitment of everyone - public and private subjects, current and future generations. Apart from a first "form" of private contribution, which could be defined as "indirect" or "necessary", in the sense that all the private activities that might harm the environment can be carried on only after the verification of the respect of all the applicable legal standards, a very important role for the environmental protection is played by the voluntary contribution of private individuals. The spectrum widens, being able to include here all the behaviors spontaneously adopted to promote an increase in the environmental protection level, beyond the minimum guaranteed by the law through regulatory and administrative activity. However, even these behaviors have very different purposes and characteristics, so that further distinctions are necessary. In particular, turning attention to the "aims" of ecologically virtuous conducts, even in the impossibility of investigating the real animus, it is wise to distinguish the voluntary conducts between those that are expressions of a particular environmental sensitivity from those, equally deserving of appreciation and promotion, which would appear to be driven by reasons of economic convenience, direct (think, for example, of green incentives) or indirect (for example, for the expansion of customers that could derive from the offer of greener products and services).

Among the first category, it is possible to include both individual conducts (the preference for more eco-sustainable products and services, lifestyle habits with less impact on the environment, etc.) as well as collective ones. Both, but the former more, are strongly conditioned by the socio-cultural context and the awareness of the primary role of individual behavior in protecting the environment. It means that more environmental education is an indispensable factor for effective protection. The role of consumers in protecting the environment, in fact, must not be underestimated, nor, at the same time, "exploited" through false promotions of green products and services (so called "greenwashing").

With reference to collective conduct, it is worth to recall the invaluable contribution of the environmental associations. In Italy, for instance, at least since 1986, with the l. establishing the ministry of

environment, the role of the associations has been enhanced, at least in favor of those representative ones with the attribution of the legal standing.

2. Market based tools for environmental protection

Moving on to voluntary behaviors that seem to be based on (or even on) parameters of economic convenience, they are absolutely (and rightly) recognized and promoted by the legal system: the reference clearly goes to the environmental protection tools known as market-based tools, to distinguish them from the authoritative tools (command and control). That of private individuals who improve their environmental performance to achieve an economic advantage, such as, for example, that deriving from access to public incentives or from the possibility of obtaining a certification attesting to the environmental compatibility of the goods produced and services offered, undoubtedly represents an indispensable contribution to greater environmental protection.
Traditional authoritative measures, which necessarily find themselves balancing the environmental interest with equally relevant, but inevitably “limiting” interests, guarantee minimum protection and, therefore, are inadequate or in any case insufficient with respect to the need, even more felt as the risks are understood, to effectively counteract the increasingly rapid and visible environmental degradation. This led to the introduction of economic environmental protection tools: the greater environmental burdens are borne in view of the achievement of a direct or indirect economic advantage. The environment, even according to this model, remains a limit, a burden, which is nevertheless borne by virtue of an economic return.

3. Conclusion: Circular economy: the environment as an economic opportunity

For the private contribution to environmental protection to be truly effective, a radical change of perspective seems necessary. In other words, we need to look at the environment no longer as a limit but as an opportunity.

The concept of circular economy enters this scenario, the origins of which are primarily attributable to the specific waste sector, but immediately subject to extensive interpretations suitable for attributing the value of a paradigm applicable to the entire environmental matter. According to the new paradigm of the circular economy, the environment is increasingly turning from a "limit to development" into "development opportunities".

If, therefore, especially in application of the circular economy paradigm, the environmental and economic interests converge from being antagonistic, the margins for market failures shrink and, at the same time, the private contribution to the protection of the environment enlarges its importance.

Not surprisingly, the introductory paragraph of the Communication of 11 December 2019, COM (2019) 640, the European "Green Deal", is significantly titled "Transforming a pressing challenge into a unique opportunity". The message is immediately clear: environmental interest is not (anymore) only a value to "protect", but also a factor to be exploited to foster growth and innovation.

With the European Green Deal, the Commission reaffirms and generalizes the changed approach to the environmental issue: a continuous challenge, but, at the same time, an opportunity. Environmental interest, which limits the possibilities of development, by virtue of the prevalence of the "conservative" component of environmental policies, is transformed into an economic lever, into an ambitious potential for the promotion of new growth tools.

This does not mean that the concept of limit can be totally overcome, since the issue of scarcity of resources clearly remains, but the - new - perspective of the circular economy, on the one hand, can help to reduce or in any case "slow down" the process of exhaustion of resources - also important to have "more time" to search for alternative "solutions". On the other hand, as mentioned, the paradigm of circularity, unlike that of sustainable development, which is mainly based on the need to put a stop to the exploitation of resources by present generations to ensure their availability also for future ones, aims to reconcile the needs of nature with economic ones, insisting above all on the “convenience or, better still, on the “opportunity” of the environment for economic growth.
The anthropocentric perspective, the inevitability of which is evident, finds further expression and enhancement precisely in the words of the European Commission, aware that effective environmental

protection cannot be achieved if, also in the light of the persistent reluctance to perceive the urgency of environmental issues, does not rely on reasons of convenience, at least with respect to propulsive environmental measures, additional to those that result in limits and impositions.

This is also and above all thanks to the emerging concept of circular economy, whose first important reference at European level is contained in the Seventh Environmental Action Program of 2013 and initially developed, at least mainly regarding the waste sector, to offer a new vision, no longer - or at least not only - in terms of problem to solve, but also of in terms of "resources". In fact, among the goals of the Seventh Environmental Action Program there was, first of all, the implementation of the waste hierarchy to ensure that landfills are limited to residual waste, that energy recovery is limited to non-recyclable materials, that hazardous waste is managed responsibly and that production is in any case reduced and that concrete actions are taken to combat the transport of illegal waste.

Consequently, it is worth to rethink the very concept of "product", dealing with "downstream" management, through a greater offer of services connected to the product, suitable for guaranteeing an extension of the life cycle, but also "upstream", in the design phase, to promote different uses within the entire life cycle.

The circular economy paradigm makes it possible to more functionalize - but certainly not sacrifice - environmental protection to economic development, due to its potential in favoring innovation and employment and this seems to have a significant impact on the contribution of individuals to the protection of the environment which evolves and increases, becoming more effective.

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The role of sustainable disclosure and reporting in the public administration: the AdSP case of the western Ligurian sea

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Abstract

The work investigate into the reform process of Italian ports through the regulatory framework that encourages a virtuous use of environmental sustainability policies through the achievement of the SDGs, analyzing the port system of the western Ligurian Sea. In Italy, the regulatory reform of ports (Legislative Decree No. 169 of 4 August 2016), has set itself the goal of reorganizing governance, not only in terms of efficiency of logistical-information-decision-making processes, but also in environmental and social terms. The purpose of the work is to identify the goals set by the 2030 Agenda through an analysis of non-financial financial statements. It should be noted that, that public companies are not required to draft and disseminate sustainable reporting. This paper aims to specify the sustainability practices adopted by ports. The methodology adopted was to investigate targets within the institutional communication channels having the SDGs as a reference.

Keywords

Accountability, Sustainability, Disclosure, Port System, Policy.

1. The evolution of the regulatory-institutional context and the role of the 2030 Agenda in public and private organizations

Over time, changes in the information, needs of markets and stakeholders, attention to environmental protection and compliance with the principles of social responsibility, the emergence of new needs for accountability and transparency, have led to the development of tools for disclosure which, alongside the disclosure in the financial statements, makes it possible to enhance the company's attention to socio-environmental issues. The sustainability report, the integrated report and the non-financial declaration are instruments of direct accountability. The first two deal with socio-environmental documents disseminated globally, supported by international guidelines such as global reporting standards, initiatives for sustainability reporting, and the IR Integrated reporting council for integrated reporting. In Italy, these reporting tools are voluntary in nature and there are currently no specific regulations. The non-financial declaration is a social and environmental reporting tool imposed in Italy on certain types of companies by legislative decree no. 254/2016, in transposition of Directive 2014/95 / EU. Obligation, albeit only for larger companies, represents an important step; in fact, a significant number of companies converge, which since the 2017 financial year are obliged to report and communicate socio-environmental data and information (Arushanyan Y et al. 2017).

The need on the part of institutions to increase transparency, intelligibility, comparability and control of corporate disclosure, have triggered the adoption of paths aimed at spreading virtuous behavior and shared methodologies in the context of reporting non-financial information (Ceulemans, K. et al. 2015). Among the most relevant regulatory instruments that at an international and national level have helped to accelerate the integration of sustainability into business, there are:

- Legislative Decree 254/16 on non-financial information;
- the Action Plan of the European Commission to finance sustainable growth;
- the 17 United Nations objectives set out in the Agenda 2030 program. Each of these tools has a specific key function in the document in question.

Fig.1: The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015

Legislative Decree 254/16 constitutes the regulatory framework within which the structure of this document unfolds which, in addition to defining the disclosure obligations envisaged.
The Italian debate on the importance of the Sustainable Development Goals has been open for some years now and in particular since 2016. In fact, the Italian Alliance for Sustainable Development (ASviS) was established in that year, with the aim of growing Italian society, in economic subjects and institutions awareness of the importance of the United Nations 2030 Agenda and of the achievement of the 17 sustainable development goals for the future economic growth of our country. In the context of this experience, unique at an international level, the commitment and mobilization of companies in Italy emerges (Annan-Diab e Molinari, 2017): the reporting of specific information on the subject in their financial statements and the growing interest in integrating objectives into their business strategy are the proof of that. Therefore, the initiatives of the most important associations of the Italian business world are fundamental which, starting with Confindustria, together with all the other confederations adhering to the ASviS, in 2017 sign the "Pact of Milan". This agreement involves a commitment to promote, in line with the United Nations 2030 Agenda, the innovation of business models, partnerships with all stakeholders and the use of ethical and responsible finance, drawing up concrete proposals and shared to create a suitable context for sustainable development and, more generally, to favor the ecological transition of the production system, capable of supporting the development of territories and their resilience (Bebbington J., 2001). Also in this case, the usefulness of the Confindustria guidelines for sustainability reporting for SMEs is noted which, while not providing for a detailed review of the disclosure on the subject of SDGs, constitute a tool at the service of companies to define what type of information and, therefore, what possible commitments / targets to link to the 17 goals of the United Nations.

2. The “green” role of the port system of the Western Ligurian Sea: reflections

In recent decades, port sustainability has become a topic of fundamental interest for port policy makers (Chin-Shan et al. 2016) and must be oriented towards an economy capable of promoting economic, social and individual well- being, making the use of primary and secondary resources available as a function of consumption more efficient. However, although the PAs are called upon to ensure that the development of ports takes place in a condition of balance between costs and benefits both with respect to the environment and in the adoption of legislation on the use of energy (Verhoeven 2010), the concept of sustainability and in particular of "sustainable performance towards the SDGs" hardly finds confirmation in the literature and in practice. In the perspective of integrating corporate action with the prerogatives of sustainability, a substantial change in business models is required that include strategic measures aimed at meeting the SDGs (Fleacă et al. 2018).
On the other hand, for non-economic public companies, such as AdSPs, it must be taken into account that, if on the one hand, by its nature, the authority is not required to report through the NFR (e.g.

sustainability report) its own initiatives regarding environmental sustainability and even less the SDGs (Di Vaio et al. 2018), on the other hand, the adoption of behaviors that reflect a decision-making process aimed at environmental sustainability also adopting disclosure practices for all stakeholders as is the case for companies . Moreover, in June 2019, a sentence of the court of Genoa, albeit in the matter of antitrust legislation, recognized the AdSP in Italy as a company. The scenario described determines an

important initiation effect on the measurement and communication of the progress made in disseminating the SDGs, even though these companies are not yet able to explain and demonstrate the positive impact of achieving the objectives for investors, employees, and other stakeholders (Zijp MC et al. 2015).
The Port System of the Western Ligurian Sea constitutes, by the nature of the activities that take place on it, a complex area in which activities pertaining to the industrial, civil and transport sectors are present and interact, with considerable impacts from the energy and environmental. This implies the need for an integrated approach that takes into account current and future needs relating to the different areas covered.
The strategies of the Environmental Energy Planning Document of the Western Ligurian Sea Port System (DEASP) are therefore defined starting from the analysis of the state of affairs of the port center and the characterization of the ecological footprint of the activities that take place there (Kates RW2001); they are therefore coordinated with the development forecasts that project strategic and territorial planning on a medium-long term scenario and that condition the energy-environmental choices of the Authority, as well as with the most recent national and international guidelines on decarbonisation and digital innovation.
The strategic lines of the Authority are aimed at creating a Port of the Future with a Green matrix: sustainable, resilient and with low emissions, which declines its objectives of competitiveness and growth of traffic according to a paradigm of social responsibility and improvement of the quality of life both in the port area and in the urban community in which it is inserted (Carbone e Munari 2019). The Port System aims to pursue objectives of management and efficient use of natural and human resources, ensuring a more environmentally friendly, safe and efficient transport system and contributing significantly to the mitigation and adaptation to climate change. All this is very appreciable from a planning perspective and for a management that aims in the long term, but it is inevitable that the pandemic crisis we are facing slows down the path towards the objectives; but it would be much more serious if the social and economic crisis led them to be set aside entirely. This is where Goal 17 comes into play, "The global partnership for development", much criticized because it is difficult to measure and too broad: it includes topics such as finance, technology, trade. Yet, it will be easy to see in what direction we will move because this Objective requires collaboration and cooperation between all the actors, first and foremost the states. The pandemic requires more - not less - international cooperation. But if the tendency to reduce the role of multilateral and supranational bodies and civil society organizations prevails, then the 2030 Agenda will really be at risk.

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The impact of COVID-19 on Piedmont Circular Economy policy roadmap

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Abstract

The outbreak of COVID-19 in the Italian and international scenario has produced diversified responses to an unknown and unexpected event, rooted in the governance characteristics of each Country. Governments need to overcome established legislative practices and procedures, proposing new legislative and financial frameworks to address endemic or unexpected crises while pursuing sustainable development goals (Capano, 2020). The following contribution explores the emerging results from the new activities implemented by the RETRACE project to investigate how the pandemic has influenced the processes of Circular Economy (CE) that it had stimulated in four different regions considered: Piedmont (Italy), New Aquitaine (France), Biscay (Spain), North-East (Romania). Therefore, this paper delves into the situation in the Piedmont Region.

Keywords

Policymaking, COVID-19, Systemic Design, Circular Economy, Good Practices

1. Introduction

In Italy, regional authorities are key players in shaping the central government's response to COVID-19, due to the way Italian regionalism was conceived (Capano, 2020). Regional governments should therefore be able to set up laboratories to re-launch our economy, providing collaborative scenarios for recovery policies, laying the framework for the construction of the *New European Bauhaus* as a pool of innovation but, above all, demonstrating they can guarantee its functioning (Rosado-García et al., 2021). COVID-19 highlighted the shortcomings of current production and management systems, thus accelerating the pressing need for more sustainable models recalibrated to the CE framework. The paradigm shift towards a CE requires that policies can manage and solve complex problems with new approaches. However, *policymaking* presents complex wicked problems caused by the fragmentation of the *policy cycle* process (Hermus et al. 2020): there are issues at the time level; related to the *knowledge gap* given by the variety of actors involved; in data analysis and processing caused by a large amount of information and difficulties in the evaluation phase of the impacts of policies (Maffei et al. 2016). Hence, in recent years we have begun to discuss and experiment which ways to integrate tools belonging to design in *policymaking* processes, exploiting the ability of design to facilitate multidisciplinary paths and to support participatory processes (Barbero & Bicocca, 2017). RETRACE is a project funded by Interreg Europe Programme 2016-2020 that promotes Systemic Design (SD) as a method to enable local and regional policies to move towards a CE. To innovate governance addressing CE barriers with a systemic approach (Giraldo Nohra et al., 2020), it was necessary to identify education-oriented, and even more, critical policy-oriented Policy Gaps to shift to a CE model.

This allowed all regions involved to better address the nature and scope of useful Good Practices (GPs) to be specifically evaluated for the Action Plan (Barbero, 2017). In a post-pandemic scenario, the results proposed by RETRACE become more relevant than ever to explore further to address the upcoming regions' recovery strategies, proposing innovative circular strategies to build back more resilient EU regions.

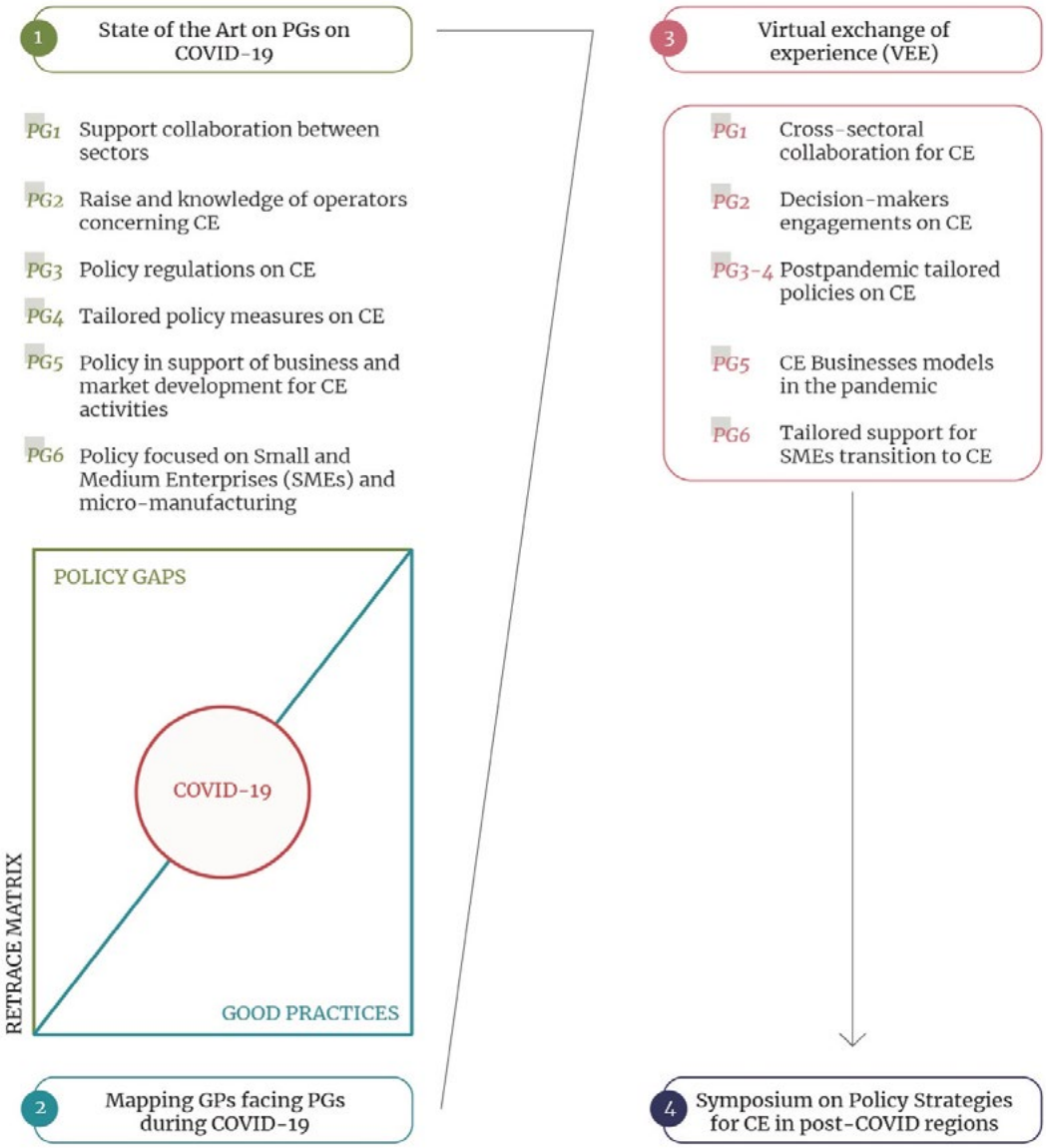

Fig 1. Building on the results of RETRACE: the four phases of the project's additional activities aim to reactivate a process of experience exchange that identifies the new GPs that have been generated in this accelerated innovation process induced by COVID-19. Courtesy of: Padula Cecilia, Pereno Amina, RETRACE: additional activities, 2022.

2. The impact of COVID-19 on the Policy Gaps highlighted in Piedmont Region

The main goal of RETRACE was to promote the adoption of SD as a method to support the transition of regional policies towards CE: in outlining the approach to the development of a new paradigm, the process of breaking down barriers between sectors must be supported at the policymaking level with a shift in the structure of policy instruments towards a more cross-sectoral approach (Barbero & Pallaro, 2018). The outcomes of the RETRACE Action Plans aim to address the cross-cutting Policy Gaps identified through an exchange of experiences that have hindered the regions involved on their path to CE (Barbero & Giraldo Nohra, 2018).
In 2021, the RETRACE project is further funded to carry out additional work on the impacts of the pandemic by addressing the regions' upcoming recovery strategies. The breakdown of COVID-19 strongly influences the relevance of future work on RETRACE project outcomes, as regions play a

crucial role at the forefront of responses to the crisis, which could help implement measures at the national level. The RETRACE consortium aims to assess the current state of Policy Gaps in all partner regions by reactivating a process of experience exchange that identifies new GPs that have been generated in this accelerated innovation process that COVID-19 has fostered [fig. 1]. Throughout the Holistic Diagnosis (HD) process to map the current state of the regional economies, the three strategic economic sectors of each of the regions were investigated. Within these sectors, the most influential stakeholders were identified to be involved in both an assessment phase and the following exploitation of project results and implementation to drive the four regional economies towards a CE model.
Strategic sectors in Piedmont have manifested rather negative economic consequences linked to COVID-19, as it represented a break in the business cycle: the lack of technological tools necessary to deal with the problems in procurement and the management of the supply chain has been denounced. Stakeholders have found a lack of coordination between the production sector and regional actors, a key element to design and implement the measures to outline a successful exit strategy. Pandemic has accelerated the digital transition of the various sectors, however, it still faces some barriers that will have to be overcome: the general level of digitization of the population, the internal skills of companies, and the related management culture.
The importance of implementing a transition towards a CE, as reported in the Piedmont *Smart Specialisation Strategy* (2021), lies in the ongoing change process on three strategic axes: ecological transition, digital transition, social and territorial impact. The instances of renewal of the productive system come from the need to restore the interrupted growth path. The boost to the economy mobilized by national and EU institutions and the urge to renew economic assets, strongly oriented to new technologies, decarbonization, and eco-investments, social infrastructure, are great opportunities to renew the distinctive skills of Piedmont, diversify assets, strengthen the entrepreneurial structure and develop companies in the productions with greater growth potential.

3. Systemic Design: boosting Circular Economy policy tools on a post-pandemic scenario

During the 4 stakeholder group meetings and the partner meeting, 40 best practices were presented out of which 24 were selected through the Online Peer Review process among the partners. The selection criteria for the best GPs in the field of Circular Economy were: degree of innovation, impact on the territory, and link to COVID-19. To assess how GPs could truly help bridge the Policy Gaps identified in each region, it was necessary to refer to the multi-criteria RETRACE Matrix as, in completing the format, partners could cite any GP that provided an inspiring perspective on how to bridge each of the Policy Gaps identified. The selection of GPs (virtuous examples of implementation of CE, tools, and policies) has allowed the identification of development trends that can facilitate the decisions of policymakers:

- green entrepreneurship: the environmental sustainability of processes is a central topic in the current political and economic debate. The crisis caused by the recent pandemic has strengthened the idea that ecological - and digital - transition must be one of the pillars of the new economic and social development model;
- digitalization: the digital transition has been the process that has been accelerated most of all during the pandemic emergency;
- city-system: whose goals, prompted more urgently by the pandemic, have generated a rethinking of private and shared spaces, mobility, and accessibility to places and services.

The results of the bottom-up approach applied, which involves the final users of the policies - the citizens - highlight the potential of the Quadruple Helix paradigm to foster and implement processes through collaboration and proactive sharing of experiences to understand the latent needs and capabilities of Piedmont in post-COVID19 [fig. 2].
In April 2022, an evaluation process of the governance tools delivered will start in order to create tangible results on the process of exchange of experiences among partner territories and to generate, through the SD methodology, concrete impacts on policymaking processes, fostering a transdisciplinary approach to close the policy cycle on CE.

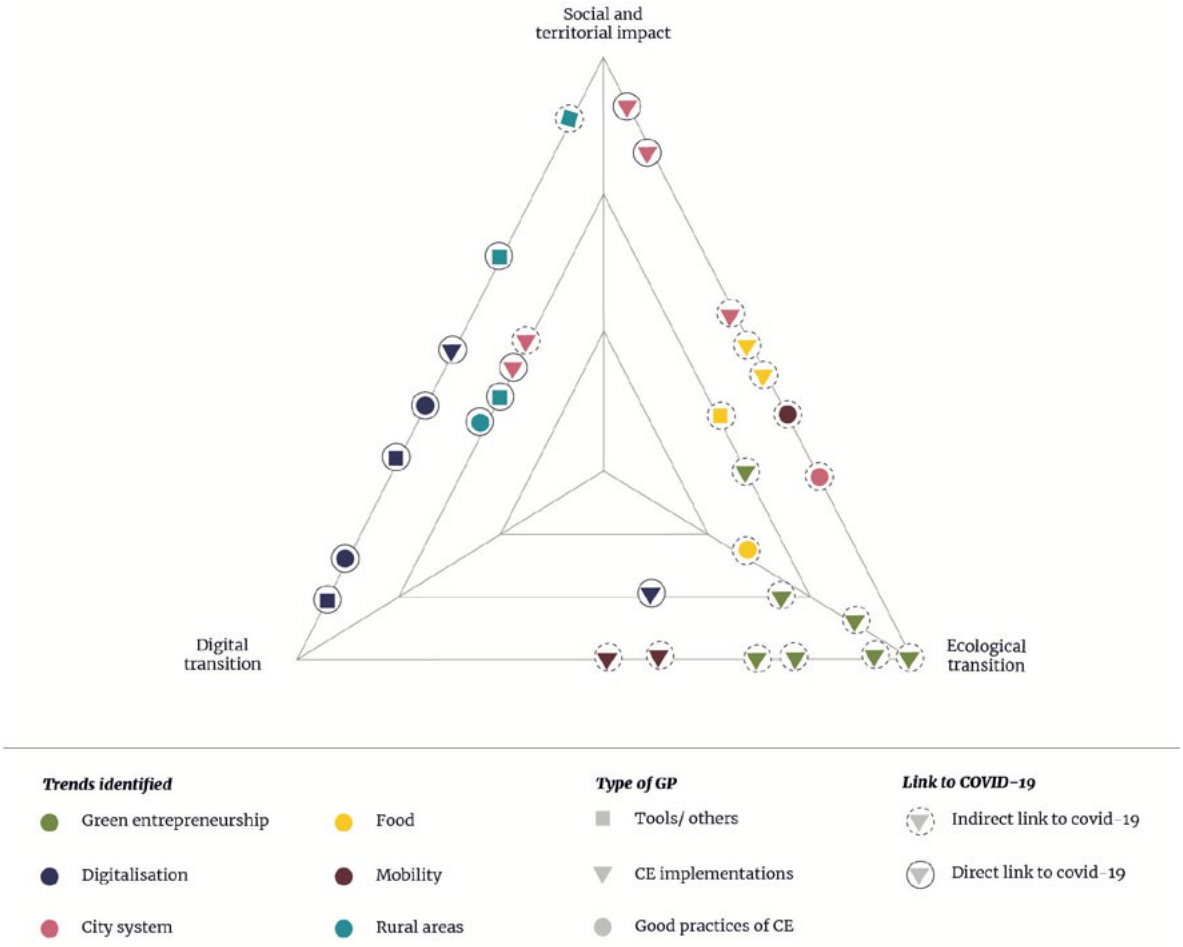

Fig 2. GPs framework of the Piedmont Region has been structured according to the three strategic axes indicated, highlighting the types according to a subsequent categorization based on development trends and the relationship with the COVID-19. Courtesy of: Padula Cecilia, Puglielli Mariapaola, Marchesi Alice, RETRACE: additional activities, 2022.

4. Conclusion

In the Piedmont region, linking the three analyses conducted - HD, Good Practices Framework, and Policy Framework - it is possible to identify areas of intervention and their respective potential applications which, with the use of a multi-criteria matrix, has led to the identification of four complementary strategies. The strategies are based on a meta-strategic vision, which leads to the identification of urban-rural territorial systems for a more holistic consideration of the regional territory. The three sectoral strategies and a fourth transversal one, propose policies and tools for sustainable development of land management, mobility networks, and digital ecosystems, with a view to inclusion and social cohesion.

The outcomes of this extension of RETRACE aim to update the project results on the current erratic scenario of COVID-19. The exchange of experiences among partner regions will provide more tools for the policymakers to deliver innovative approaches to circularity amid challenging circumstances. Practical recommendations will support the different regions on the use of recovery funds towards a *Circular Economic Recovery*. Also, it will showcase an overview of the innovative environment for the CE that the COVID-19 phenomenon brewed. Overall, the expected results will provide regional policymakers with new tools to improve policy instruments in the post-pandemic era. Collaborative methodologies have immense potential in the renovation sector, fostering sustainability through the

introduction of complementary systems. This vision of the ecosystem promotes the idea of smart territories, going beyond the idea of smart cities, by promoting the idea of a networked *place for life* revolving around the cohabitation of humans and nature on the planet, to foster a socioeconomic context that allows creating a *New Sustainability Culture* for sustainable human-nature harmony, inherent in the concept of *New Bauhaus* (Rosado-García et al., 2021).

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Urban regeneration through an integrated urban planning approach: towards a new paradigm. The Italian experience

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Abstract

In a global context characterized by serious ecological emergencies exacerbated by pandemic crisis, in the wake of significant foreign experiences, the centrality of the sustainable regeneration in urban planning policies is also emerging in Italy.
This trend affects the vision of the urban system, implying the overcoming of the rigid traditional procedural logics and the search for the connection between urban function and primary interests protection, through "flexible" design solutions, capable of "reading" the needs of the territory.
Given the above, this study examines the particular model of "integrated plans", governed by Article No. 21 of the Decree-law No. 152/2021, converted with amendments by Law No. 233/2021, and introduced as part of the measures aimed at achieving the objectives of the Italian plan for recovery and resilience, the study of which offers numerous arguments to focus on the recent approach on urban sustainable planning and on possible future prospects.

Keywords

Urban regeneration, urban planning, sustainability, integration, participation.

1. Introduction

The effects of climate change on the balance of the planet, together with the need for energy efficiency, of containment of land consumption and, at the same time, of economic development, have had significant impact on territorial government (Nespor, 2021). Finding remedies has become increasingly urgent, even in the face of the emergency caused by the pandemic (Portaluri & Napolitano, 2021, p. 242). In the context of the various solutions developed on the basis of the influence of certain foreign experiences (Couch & Fraser, 2003) the centrality of the sustainable regeneration also emerges in urban planning policies, though later and in fragmented way, due to the absence of uniform legislation on the subject, filled by some of the latest regional laws (Torelli, 2017, p. 651) in Italy (Giusti, 2018). This perspective is promoted by the United Nations (Agenda 2030) and the EU Institutions that have intensified the activation of urban regeneration processes through the EU's Green Deal and Next Generation program.

2. Urban regeneration and territorial government policies: the "key-role" of urban planning

The main As is well known, the meaning of urban regeneration is read from a perspective linked not only to land consumption and the protection of the territory, but also to the quality of the same, as a key (Bellicini, 2015) to solving numerous problems, including economic ones, that afflict urban agglomerations. In this sense, urban planning is like a "magnifying lens" that contributes to experimentation in terms of sustainable development of the territory (Gardini, 2020). This trend affects the urban planning system vision, implying the overcoming of the traditional rigid procedure model, the result of the Law No. 1150/1942 (Stella Richter, 2022, p. 9) and the search for points of connection that allow to preserve the prerogatives of the urban function ensuring, at the same time, a high level of protection of primary interests, such as the environment, the landscape and the defense of the soil, and

the integration of the social and economic fabric in which the territory is immersed (Dipace, 2014, p. 237). The planning system therefore tends to decline towards “elastic”, flexible and less conflictual planning solutions, capable of “reading” the needs and attitudes of the territory (Tigano, 2016, p. 213). To this end, the progressive recognition of an increasing weight to the role of private individuals, or to the collaboration between public and private, contributes not only in planning decisions but also in the implementation of these choices (Calabrò & Pergolizzi, 2021).

3. The example of “integrated plans”

An exciting example is offered by the Decree-Law No 152/2021, converted with amendments by Law No 233/2021, implementing Italian Recovery and Resilience Plan, which promotes the financing of “integrated plans” projects: it is interesting to attempt a reconstruction in general terms of the characteristics of the urban planning model that inspire the “integrated plans”.
Firstly, this model is inspired by sustainable development (Fracchia, 2010). Moreover, a particularly interesting profile lies in the explicit introduction, among the necessary conditions for access to financing of urban redevelopment projects, of the application of the criteria connected to the “Do Not Significant Harm” principle, as specified in the “Taxonomy for finance sustainable” (EU Regulation 852/2020), in order to protect the environment. The issue of the relationship between EU taxonomy and urban regeneration, in light of the relationship between the “Do Not Significant Harm” principle and the other principles that regulate urban regeneration processes, is still very recent, resting on new and continually evolution, to allow a wide-ranging framework perspective to be drawn, although, in the future, considering the importance that the issue is gradually assuming in the context of European sustainable development policies, an imminent reflection in this regard seems inevitable.
From a structural point of view, this model makes use of an “integrated” method, declined both on the “vertical” and on the “horizontal” level. In relation to the vertical declination of integration, the Decree-law allows the dialogue between central administration, and its peripheral articulations, and local authorities, with specific regard to metropolitan cities, whose role is preponderant with respect to that of municipalities. In relation to the horizontal declination of integration, it is very interesting the attitude of

openness towards the involvement of subjects other than the local authority in the field of planning: private individuals in the participation in the financing; public service startups in the project proposal; third sector actors in the co-planning phase. The involvement of both residents private and public service start-ups in the implementation of the integrated plan projects is compatible with the most modern concept of participatory urban regeneration; and more generally, with the most modern administrative modules based on the development of the democratic dialogue (Marzaro, 2020). The involvement of the third sector allows for the effective application of the principle of horizontal subsidiarity and it is largely consistent with the perspective recently privileged third sector, albeit with reference to different matters, by the Constitutional Court (sentence No. 131/2020). The success or failure of the legislative instruments, in this context, is associated with the social consensus that they have been able to generate in the communities where they are implemented. According to a recent theoretical reconstruction aimed at reconstructing the theme of the right city, the latter passes from the enhancement of those initiatives of the third sector aimed at improving the quality of urban life that allow a better look not only at the architectural aspect of the city, but also a social form (Flick & Flick, 2021, p. 57). Consistent with this perspective is the recent interesting expression, sociological in nature, of “convivial city” (Magatti, 2021, p. 57).
From a finalistic point of view, the particular integrated planning model could be briefly described as a planning model for “territorial projects” aimed at pursuing set objectives: the design method is probably inspired by the logic underlying the NRRP “whose conditions / reforms / components concern objectives for which the functioning of the administration (and, therefore, its reform) are functional to specifically recommended social and environmental policies” (Tropea, 2021).
In the future, the application of the model under consideration could produce an important “driving effect” of opening up to the growth of new urban regeneration tools. However, it cannot be overlooked that the strategy of “integrated plans” suffers from some limits of an “intrinsic” nature: the “genesis” of the same, strictly anchored to the "genesis" of NRRP; the “duration of the term”, strictly anchored to the deadline of achieving the NRRP objectives; contents of eligible projects.

4. Concluding Remarks

Compared to the series of reforms on urban regeneration, already inaugurated on the impulse of regional legislation and at the initiative of some local authorities, the recently inaugurated one seems to represent the result of an important signal of renewed attention by the state legislator towards the opening to new scenarios and new paradigms for the sustainable development of the territory. The risk is that the experience of the implementation of "integrated plans" (and, in any case, of all urban regeneration projects financed under the implementation of the NRRP measures) is limited to the current context and that it will be set aside, especially at the end of the "season" of emergency legislation. This scenario, in addition to undermining the compatibility of these projects with the principle of good performance (Spasiano, 2017), negatively affects the implementation of the program Next Generation Eu, which is finalized "rethink the intervention of the State in the economy and redesign the role of the public in relation to society, [...] decide how to place public administration in the process of economic revitalization and social recovery".
It is urgent to reflect on: the concept of urban regeneration; the relationship between urban regeneration and urban planning tools (Giusti, 2021; Veltri & Gatto Costantino, 2021). These points of view could be clarified by the contribution of a long-awaited, and subject to wide debate, organic state legislative intervention dedicated to urban regeneration, which however does not appear completely exhaustive if it remains isolated, whereas it is desirable that it should be placed in the context of a broad framework of territorial governance reforms.

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Brand urbanism and future scenario to promote sustainable buses public transport. A case study

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Abstract

It is well known that a widespread good quality of urban life contributes to the containment of inequalities between portions of the territory, and that the occurrence of these conditions influences the attractiveness and competitiveness of cities and the businesses that operate in them. Today, some 3.5 billion people live in cities, a number that is set to rise to five billion by 2030. This should make us reflect on the symbolic value that the 'res publica' must assume and make us rethink the role of the individual citizen in building a sense of belonging and identity to the community. To design a systemic and long-term transformation in urban contexts at various levels, the paper presents a case study of brand urbanism linked to the enhancement of places through an improvement of urban mobility services and the ability to intercept resources and energies already active locally. The paper presents an example of good practice and manages within Goal 11 of the 2030 Agenda, in consideration of a fluctuating trend in the decade 2010-2020 which, according to the ASVIS 2021 Report, has shown in the Italian context a worsening towards the achievement for Goal 11, especially for public transport.

Keywords

Brand urbanism, public transport, strategies for smart city, design for territories, sustainable mobility.

1. Public transport and air pollution

Air pollution is a global threat leading to major impacts on human health and ecosystems, emissions have increased in many areas around the world, and even in Europe air quality remains poor. Moreover, air quality problems such as respiratory problems, cardiovascular diseases, asthma and allergies are considered a serious problem by European citizens (European Commission, 2019) and cause serious health problems especially in vulnerable groups, such as children who spend a lot of time outdoors (Terenzi & Pisello, 2020; Dixon, 2002). There is therefore a growing political, media and public interest in air quality issues with initiatives ranging from scientific activities to promote awareness, to public activities to engage citizens towards behavioral changes. The Oms has been working for a long time on the effects of air pollution on health, in 2020 has in fact implemented the Breath Life campaign that, developed together with the Climate and Clean Air Caoalition, UNEP and the World Bank, mobilizes communities to reduce the impact of pollution on our health and climate. The issue of mobility is intricately linked to air pollution, hence the need to plan ideal models of sustainable mobility. The 2030 Agenda, adopted by the United Nations General Assembly represents the global plan of action for achieving sustainable transformation of society, the economy and the environment. Today, some 3.5 billion people live in cities, a number that is set to rise to five billion by 2030. This figure highlights the urgency of identifying best practices to be implemented in order to design a systemic and long-term transformation in urban contexts at different levels, in view of a fluctuating trend in the decade 2010-2020 which, according to the ASVIS Report (2021), has shown in the Italian context a deterioration towards the achievement of Goal 11, especially for public transport. Regarding the Italian transport situation, according to the 3rd SDGs Report by Istat (2020), the analysis for Italy of "Goal11: Make cities and human settlements inclusive, safe, resilient and sustainable" shows that about a third of households are dissatisfied with the use of public transport: in 2019, 33.5% state that they have a lot or enough difficulty in connecting in the area where they live. L'ANFIA (2020) provides other important data relating

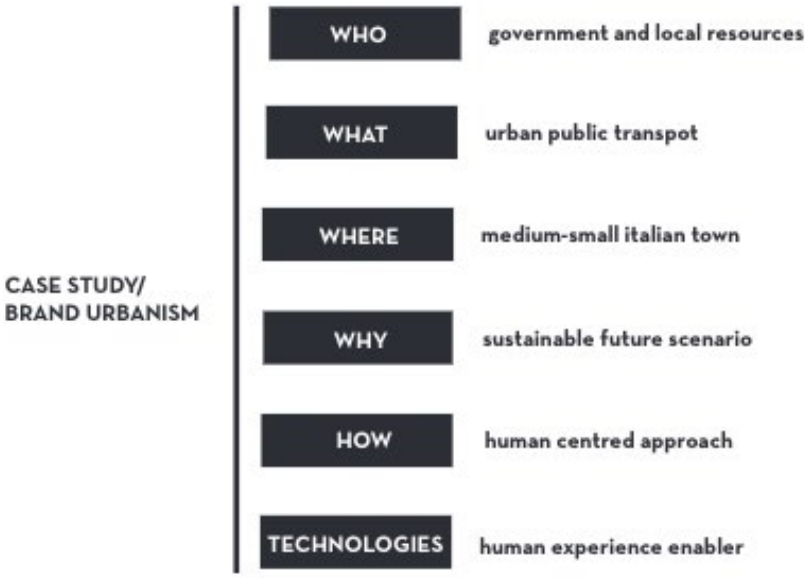

Fig 1. Brand Urbanism approach in urban mobility contest. Research framework by Author.

to mobility. In Italy there are 39.5 million cars, 100,000 buses and 6.9 million motorcycles are the numbers of motorized road transport in our country. 76.5% of passengers per kilometer transported in a year are by car, 11.6% by bus, streetcar, trolleybus and metro, and 3.4% by motorcycle. Mobility is made up of millions of movements, billions of kilometers travelled on urban and suburban roads and external economic and environmental costs that weigh on the entire community. Italy is lagging far behind in terms of investments in electric mobility and only 5.4% of urban buses have zero emissions. According to ANFIA data, only 63 electric and hydrogen buses were registered in Italy in 2019. According to the new study by Transport & Environment (2020), Environmental NGO and promoter of the Clean Cities campaign, to which Legambiente also adheres, Italy is at the bottom of the ranking, with only 5.4% of new buses entering service in 2019 hydrogen or electric, followed only by Greece, Switzerland, Ireland and Austria.

2. Brand Urbanism to promote sustainable practices in cities

The advertising in the urban context has often been placed as a disturbing element, as yet another imposition of consumerism on society. Squatting and malpractice have then intensified the phenomenon, leading cities to be victims of this mechanism (Rognini, 2008). The imposition of these messages, perceived as commodification and sale of public land, has then influenced the negative perception of the practice. In Italy, Legislative Decree 507 of 1993 regulates billposting spaces, establishing a tax for the benefit of the municipality, which also determines limits and prohibitions in relation to the public interest. The latter must also establish the distribution of spaces between institutional, social and economic interests. The billposting initiative must therefore be preceded by a declaration that establishes its modalities, characteristics, duration and location.
In parallel, Brand Urbanism implements an emerging practice that consists of forming partnerships with cities to relaunch and/or finance temporary or permanent urban development projects. It defines a new role of brands in public space, using part of the advertising budget to improve the quality of life of its consumers. This is done in response to consumers who are citizens of brands and expect brands to meet the expectations they create in line with their core values (Laville, 2019).
There are three main players at the centre of the rise of Brand Urbanism: the city, citizens, and local brands that want to forge closer relationships with their customers, demonstrate their social utility, and tell the outside world about their values (Gehl, 2010). This fits perfectly with the new need of cities that are looking for economic resources, expertise and partnerships to meet the challenges of the 21st century. On the other hand, brands have growing advertising budgets and are looking for new ways to reach their target audience, most of whom live in cities. This is precisely what Brand Urbanism can

Fig 2. Description of the technical and aesthetic features of the CiCO product-service shelter and mobile app.

achieve. In fact, by allocating a fraction of their marketing and advertising budgets to funding urban development and improving the quality of life for citizens, brands can actually influence people's lives in new and positive ways and create a lasting and positive emotional connection with consumers through meaningful products and services. This is a great and promising new field of opportunity for public-private partnerships at the forefront of communications.
More broadly, transportation infrastructure has great potential for brands to effect change in urban areas. By improving existing services, they can have a lasting and positive impact on the daily life of the city [fig. 01].

3. CiCO eco - city – community: sustainable bus shelters.

With new needs and new global dynamics, cities are changing and with them also the furniture and related services. As we move towards smart cities, these too are taking on an increasingly smart form, the intention being to make spaces more usable, healthy and attractive, as well as more integrated with a view to an ecological transaction. Here the possibilities given by new technologies are countless, such as networks of sensors or other surveying instruments able to measure different parameters for an efficient management of the city, allowing greater efficiency by monitoring pollutants, lighting, irrigation of green spaces, noise mapping and more. The new elements of street furniture, in addition to ensuring greater efficiency, will have to be rethought in a circular perspective. It will be necessary to ensure a more appropriate use of resources and raw materials that will be renewable, recycled or recyclable, will have to eliminate waste, designing for greater durability, adaptability, modularity and thus allowing a decrease in costs of construction and maintenance.
With the will to respond to these needs comes the project of brand urbanism for the shelters of public transport that is placed in the context of the city of Perugia, capital of the Umbrian province of about 167,000 inhabitants. The first part involved the analysis of the context and the criticality assessment of

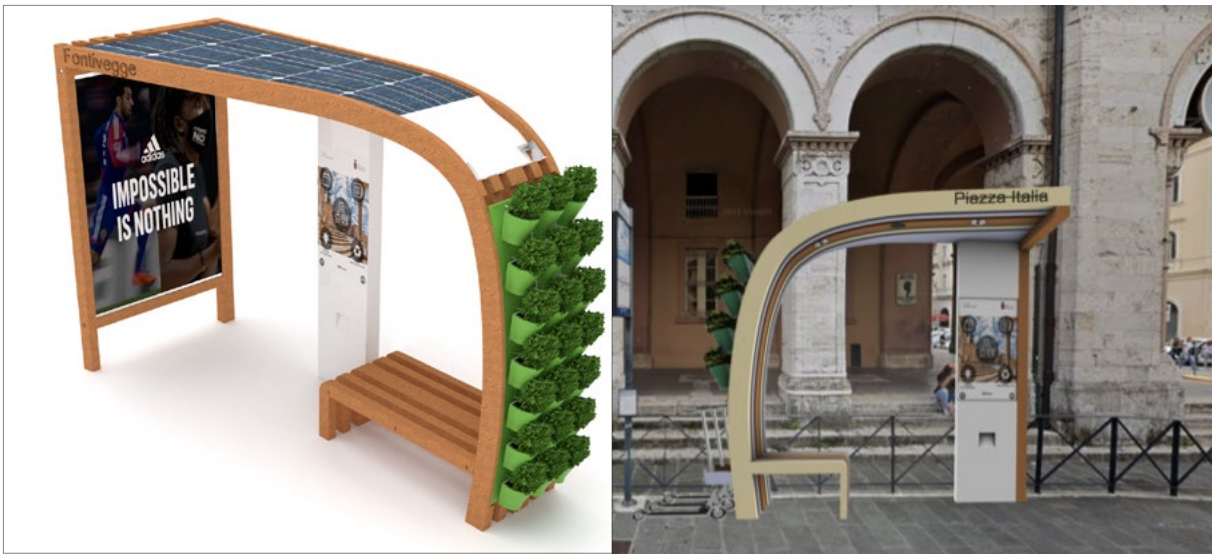

Fig 3. Rendering of the shelter in two different urban contexts of the city.

the city mobility through desk research, interviews and focus groups, for the problem finding phase. Operating as conscious designers means to responsibly enter a scene in full action, interpreting the movement and the voices of the actors, interacting with the heritage of works, infrastructures, roads, sidewalks, trees, lawns, lighting elements, seats, shelters, wings, plants and technological networks that form the physical and infrastructural support.

- Project constraint

Embed the project in the city of Perugia, understanding the needs and criticalities also related to the problems of climate change and air pollution, to provide a useful service to the administration and citizens in terms of environmental, social and economic sustainability.

- Goals

Definition of a product-service to improve and encourage the use of urban mobility that can stimulate pro-environmental behavior in favor of the decrease of city traffic and air pollution.

- Strategies

Eco-sustainable solutions for a high-tech shelter to improve the usability of the service and encourage the dissemination of information about the activities of public administration, the territory, and the care of the same. Introduction of a mobile app to make the service inclusive, updated and safe [fig. 02].

The project is part of the route of the R line, considered particularly significant because it starts from the central train station of Fontivegge and ends at the historic center of the city, specifically in Piazza Italia [fig. 03].

The work intends to define a pilot project for intervention in small and medium urban contexts typically italian, aimed at promoting, on the one hand, the rooting of the transformations and the appropriation of new practices of use by users, on the other hand, forms of innovation in the design of urban public space, its constituent materials and methods of design and implementation (Manzini, 2014; Carmona, 2019).

4. Conclusions

The sustainable product-service in support of urban mobility for buses illustrated here is the result of a design process that has aimed to incorporate and put into system, thanks to the technical support provided by the company IGPDecaux, cutting-edge technologies and services for citizens, through the

practice of Brand Urbanism. Imagining the way in which investments and changes limited in space and time can improve the conditions of comfort in the city, the concept of the CiCO product-service proposes to consider the city as a space of relationship between things and people, a scene in which you enter, leave, eventually producing new conditions, through defined spaces o responsibility: by administrators, decision makers, visionary designers, active citizens or simple users. The work intends to demonstrate how virtuous behaviors can be stimulated through information strategies, aimed at increasing knowledge and awareness, and structural strategies that aim to change the circumstances in which decision-making behaviors are implemented. This can also start from pilot projects in cities and therefore from administrations that, representing the place of decisions, must direct development and new realities in this direction. Urban projects must therefore aim at full sustainability, both in the functional and social components, exploiting the system of tenders in order to encourage competitiveness among the various companies operating. New regulations must seek to stimulate and incentivize pro-environmental behavior through incentives and, where necessary, new taxes. The action of the individual, although not sufficient on its own, must be enhanced through the adoption of projects such as this one that activate sociality and exchange, with a view to promoting virtuous emulation that will create critical mass. However, in order to define meaningful actions, it is necessary to achieve cooperation between administrations and citizens. It is necessary to create opportunities for dialogue, participatory planning initiatives; to absorb as many ideas as possible in order to save the future of our cities and thus our future.

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Common goods: an instrument for citizen inclusion and urban regeneration

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Abstract

The paper deals with the theme of the shared administration of common goods, as an optimal tool for urban regeneration and the involvement of private individuals in the management of territory. Shared administration is implemented through three fundamental steps: the constitutional principle of horizontal subsidiarity – provided by art. 118 Cost. -, the regulations of shared administration and the collaboration pacts. The latter are tools through which both the administration and active citizens agree on interventions and methods of managing common goods.

Keywords

Urban regeneration, Common goods, shared administration, collaboration pacts, citizen inclusion.

1. Introduction

Urban planning has always been a matter of particular importance for public administrations, a neuralgic sector where various interests at stake emerge – more and more often – both of private and public nature. In recent decades, with the spread of the phenomenon of the exhaustion of environmental and natural resources, there has been a need to change the models of governance of the territory. Given the inadequacy of public policies, the doctrine began to investigate on the nature of the factors that negatively impacted the territory. In the first place, it was realized that the classic forms of territorial policy, characterized by the planning power of the Public Administration and the logic of construction (so-called urban expansion) are the main source of land consumption (natural and exhaustible resource), as a constant threat to the environment. Therefore, the current challenge is to provide public policies that can effectively counteract and limit land use. The problem is not only specifically Italian; moreover, the European Union has set the great goal of land consumption equal to 0 by 2050. What follows from this is that all legislation of the Member States must take account of this objective and those public policies must comply with it. This aspect is confirmed by the internal legislation of member states that is implementing the Recovery Fund (or Next Generation EU), which aims to build a "new" Europe, focused on the theme of ecological transition.

2. The link between common goods and urban regeneration

The doctrine, therefore, has questioned the possible useful tools in order to limit the unconditional use of the land, as an environmental source that has to be protected. It was immediately realized that the classic tools of urban planning are not suitable in order to avoid the problem of land use. In this situation, the institution of urban regeneration has made its way, based on the logic of reuse of the already existing heritage. From the definitory point of view, the term urban regeneration refers to a coordinated set of recovery interventions meant to be carried out in strongly degraded areas, from an urban, building, environmental and social point of view.
Urban regeneration, therefore, has as its final objective to rebuild the territory not only from an urban and building point of view but, above all, to strengthen social cohesion among citizens.

In general, the theme can be analyzed under two aspects: whether urban regeneration involves the planning power of the Public Administration it can be defined as macro-regeneration; if, otherwise, it intervenes on specific assets it is called micro-regeneration.
Micro-regeneration is closely linked to the theme of common goods, i.e. material, intangible and digital goods that citizens and the Public Administration recognize as functional to the individual and collective well-being.
One of the most interesting aspects is the one relating to the involvement of private individuals in the co-design and co-management of them. It seems appropriate to note that the theme of micro-regeneration, as well as that of common goods, implies a preliminary in-depth study of the territory covered by the intervention; in fact, the analysis of places, stories, traditions of the community of reference is of particular importance. At the heart of this issue there are the citizens, as those who will directly benefit from the effects of their involvement in the management of such collective interest.
The extraordinary nature of the theme is found precisely in this aspect; there is a revolution in the schemes of action of the Public Administration. In these cases, it does not act according to classical schemes, characterized by imperativeness and authoritativeness, but uses models of sharing characterized by equality. From the legislative point of view, the Italian Constitution provides for the principle of horizontal subsidiarity, article 118 last paragraph, according to which the Public Administration, at any level, must favor the autonomous citizens' initiative for the performance of activities of general interest.
The scheme of action, defined as shared administration, allows the parties, public and private, to carry out activities concerning the care, regeneration and management of assets on an equal footing.
It is appropriate, at this point, to understand what are the tools through which it is possible to realize, concretely, the shared administration.
The management of common goods is carried out through three fundamental steps. If at a more general level, there is the principle of horizontal subsidiarity, at the directly underlying level there is the so-called Regulation on the shared administration of common goods, a regulatory act through which the Public Administration regulates the organizational model that allows the so-called active citizens (both individuals and associates) to carry out activities of general interest on an equal footing. At the basis of the choice of using the instrument of the regulation there is, certainly, the idea that it has a fast approval and adoption process, capable of easily adapt to the concrete needs that it intends to achieve. Currently, it is not only the Municipalities that stipulate the collaboration pacts, but it has been noted – in particular in the last time period – that the instrument is also strongly used by the Unions of Municipalities (i.e. the Union of Municipalities Bassa Reggiana, Valtenesi, Romagna Faentina) and by Regions (Lazio Region).
The Regulation, therefore, has the function of providing possibilities and ways through which it is possible to implement shared administration. The instrument that, however, concretizes the relationship between the Public Administration and the citizens is the collaboration pact, an act through which the parties define the concrete scope of the interventions. From the definitory point of view, the collaboration pact is an instrument that does not have an authoritative nature and that contains the "detailed" discipline of the intervention, that is, the objectives to be achieved, the methods of execution of the pact and the obligations assumed by the parties. The collaboration pacts, characterized by a flexible nature, are able to adapt to the specific needs that the parties intend to achieve; in practice, we can find pacts aimed at the protection and conservation of public greenery, care of urban furnishings, redevelopment of parks and buildings, maintenance and cleaning of public areas.
With regard to the general characteristics of the pacts, it is important to distinguish between ordinary pacts and complex pacts, based - mainly - on the nature of the asset that constitutes the object of the intervention. Such complex pacts relate to the management of assets with an important historical, cultural and economic value, while the simple ones provide for simple and small interventions. The function of the pacts is to implement the Regulations of the shared administration and identify, in practice, the good, define the terms and objectives of the collaboration, the duration and responsibilities of the parties. The benefits deriving from the stipulation of the collaboration pacts are found in the fact that they are able to involve private subjects in urban regeneration projects, as well as in the informality of adoption that makes it advantageous compared to other typical instruments of administrative law, for example assignments, concessions, etc. In fact, the legal nature of the cooperation pacts is not yet clear. If for part of the doctrine these have the nature of agreements between the Public Administration and private individuals, pursuant to art. 11 L. 241/1990, considering the public interests that have within them, for some of them have a contractual and, therefore, private nature. The debate is still open in

doctrine, even if the idea that the nature of collaboration pacts is "variable geometries" has recently been put forward; that is, that they must be examined case by case. Despite this problematic aspect, however, the collaboration pacts have had a rapid diffusion, as they are easy to apply and replicate and are capable, above all, of achieving the typical objectives of urban regeneration, such as social cohesion and territorial innovation.
Considering the flexible nature of collaboration pacts, in practice it is possible to find various types of them; the most peculiar aspect – certainly – is that they can easily adapt to the communities of reference. The theme of common goods includes within it the one of the history of places and communities. Emblematic is the example of the Asilo Filangeri (declared a UNESCO World Heritage Site in 1995), a semi-abandoned place that has now become a model for the shared management of common goods, in which experiences of planning in the field of arts, culture and entertainment coexist. If in the past, collaboration pacts had been more used by subjects operating in the third sector, today the use of collaboration pacts has increasingly widespread even in private companies which, through them, enjoy various benefits (e.g. new jobs and new earning opportunities).

The safeguarding and enhancement of tangible and intangible cultural resources is aimed both at better transmission to future generations and at improving the fruition and accessibility of places. “This heritage, as a whole, constitutes an essential element of civil society and civic identity” (Settis, 2002 p.20) and “the effectiveness of protection consists mainly in the ability to transmit to society the sense of belonging to a specific place” (Giusti, 2020 p.412). The condition of deep degradation in which it is located, opens up reflections on the loss of values of a testimonial monument important for the city, but especially for the eastern area of Naples. Although the charm of the ruin, in the history of mankind, (Picone, 2012) has raised an interest in those who observe it, we cannot afford to lose yet another important testimonial value. “The loss of memory [...] coincides with the substantial loss of identity” (Ferraris, 2014 p.245).

3. Conclusions

In conclusion, we can note that shared administration makes it possible to give back to citizens places that would, otherwise, be forgotten. It therefore represents one of the major tools for the involvement of citizens in the management of public affairs, as well as a place where the regeneration of the territory and citizens coexist. The shared administration makes citizens protagonists and aware of the territory that they inhabit, able to improve it and adapt it to the new needs of the city and, at the same time, to rediscover it under a new guise.

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10 Re-shaping planning approaches, tools and processes for a sustainable, inclusive, and resilient future

Museum and the Community: a case of Participatory Intervention of an Old Community in Shanghai

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Abstract

With the transformation of urban development from urban sprawl to urban regeneration in China, human-centered design thinking is increasingly considered in regeneration projects. Focusing on the old community regeneration in Shanghai in the Chinese context, the paper studied a participatory intervention case in Dongchang Community in Lujiazui District of Shanghai, a micro regeneration of an interior parking space of non-motor vehicles. Based on the practice and observations of the project and follow-up management and maintenance, which the residents are empowered to participate in spontaneously, the paper discusses a method of participatory intervention interactive of the museum into the community, which strengthened the interactions among the residents towards a sustainable community regeneration.

Keywords

Participatory intervention, micro regeneration, old community regeneration, human-centered design, museum and community

1. Introduction

This paper originates in the author's practices in old community regeneration in Shanghai in the last few years. After experiencing a rapid urban sprawl in the past decades, China has entered a stage of urban regeneration. The thinking of human-centered design in urban regeneration has been getting more and more attention from both the architect and government. According to the *Wuhan Placemaking Week 2018 Report*, "*Most Chinese cities confront challenges, from limited availability and accessibility to a lack of informal public life or sense of community ownership.*" In Dec 2018, UN-Habitat and Wuhan Municipal People's Government launched Wuhan Declaration in the Placemaking Week and made seven commitments on Chinese public spaces. Community, as one of its four sections, demonstrates the incredible determination of the government in the community's development. In the Western context, community planning focuses on physical and social spaces (Manzini, 2015), and the community-based bottom-up interventions are the same as top-down interventions for the residents (Jacobs, 1961, Magnaghi,2005). According to Manzini (2015) and Yamazaki (2019), the community would achieve social innovation by placemaking when the residents participate in the design or even design by themselves. This paper will discuss a participatory intervention case in a parking building for non-motor vehicles in one old community in Lujiazui District of Shanghai, where the famous Lujiazui CBD is located. This practice started in 2019 and lasted for three years with 3 phases. Based on the observation and research on the participation of residents in this project, the paper is trying to explore and discuss an effective method of participatory intervention in old community regeneration in China. A successful participation intervention can mobilize the participation of residents, create connected and accessible spaces, empower residents in the improvement, management, and maintenance of their public spaces, which is consistent with the idea of old community regeneration.

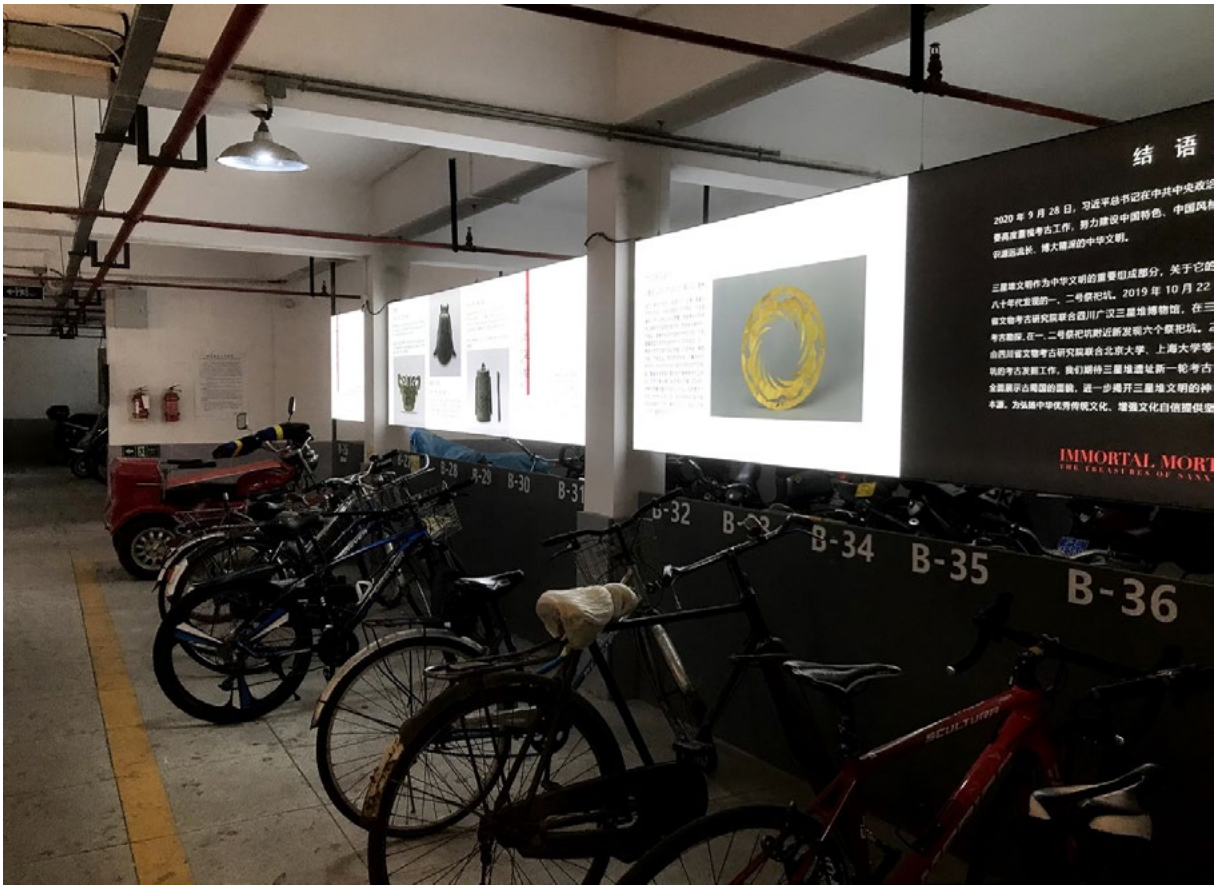

Fig 1. The 2nd phase of the project: The exhibition of *Immortal Mortals: The Treasures of Sanxingdui* in the interior space with the parking of non-motor vehicles (photography by the author)

2. Background

Lujiazui is a shining landmark of Shanghai, experienced a rapid development into a financial district of Shanghai since 1990. Lujiazui's success in the last decade has fuelled the economic growth of Shanghai. However, Lujiazui also has another type of urbanscape of old communities, entirely different from skyscrapers. Dongchang Community was built in the 1980s, located at the foot of the highest skyscraper, Shanghai Tower. It has a longer history than Lujiazui, but its building and environment are old as its age. Commonly, the kitchen is outside the apartment, and clothes hang everywhere because the interior space is very crowded. Although the living condition is not good, the apartment price is relatively high at around 20,000 dollars per square meter, according to the real estate agency Beke in Mar. 2022, because of its central location.

The micro regeneration practice of the Dongchang community started in 2019 and lasted three years with three phases. The 1st phase is the environment micro regeneration of a one-floor public building with a community center and an interior parking space for non-motor vehicles. A small garden of Hydrangea macrophylla was created in a small field in front of the building, transformed from an abandoned area. The 2nd phase and 3rd phase are an insert of two picture exhibitions of the Museum of Shanghai University into the interior parking space for non-motor vehicles. The project is a bottom-up intervention, 92% of whose budgets are from society and enterprises. The 1st phase costs 83,000 Yuan in total, 68,000 Yuan from enterprises, and 15,000 Yuan from the government. The budgets of the 2nd and 3rd phases are 70,000 each, all from the museum. The study on the case of participatory intervention will discuss the interaction between the museum and community and interactions among residents to describe how the participatory intervention empowers the residents to participate in management and maintenance for the community development sustainably.

Fig 2. The 3rd phase of the project: The exhibition of *An Art Dialogue with Longmen Caves* in the interior space with the parking of non-motor vehicles (photography by the author)

3. Museum and the Community

The cooperation between the museum and the community was emphasized when the museum's role in contemporary social development was discussed in the roundtable between UNESCO and the International Council of Museums (ICOM) in San Diego of Chile in the 1970s. Looking at the themes of International Museum Day chronologically, the relationship between the museum and community is discussed several times with different themes. For instance, the theme of 2001 was Museum: Building community, and the theme of 2022 is The Power of Museum, intending to explore the potential of museums to bring about positive change in their communities through three lenses. One of the three lenses is "*the power of community building through education: Through its collections and programmes, museums thread a social fabric that is essential in community building. By upholding democratic values and providing life-long learning opportunities to all, they contribute to shaping an informed and engaged civil society.*" (ICOM, 2022).

Compared with the international concept of the museum and community, the link between museum and community is fragile in China. Although some exhibition projects took place in communities in China, such as the *water system museum* curated by Minghao Cao and Jianjun Chen, which is bottom-up by some artists, most of these projects lack the museum's participation. A Chinese museum is primarily a place still far away from the community's life, especially for the old communities, whose main population is older people.

The 2nd and 3rd phases of the intervention were a practice collaborated with the Museum of Shanghai University and Lujiazui Community Foundation. The museum had a special exhibition named *Immortal Mortals: The Treasures of Sanxingdui* on Nov 21, 2020, and another picture exhibition of it was inserted into 2/3 of the interior parking space as an additional exhibition in Dongchang community, outside of the

Museum on Jan 22, 2021 [Fig.1]. Another 1/3 of the interior space had another picture exhibition named *An Art Dialogue with Longmen Caves*, opened on Jan 8, 2022 [Fig.2]. The display of the pictures brought a cultural tour to the community and made a micro regeneration to upgrade the parking space. For example, the signage system was renovated, and the space's illumination became brighter than before.

Because the exhibition was exhibited in a daily space of the community, it attracted residents from the district and outside. The museum extended its cultural education to the community and residents, adding more cultural value to the public infrastructure with a creative public space. Based on the observation and the interview with the urban management officer, the residents park their non-motor vehicles in good order now. Furthermore, the behaviours that residents used to smoke in the parking space and throw cigarette butts anywhere disappeared because of the exhibition and micro regeneration. They thought it was a proud and beautiful space of their community, which everyone should take good care of the public space as the residents living here.

4. Interaction among Residents

Museum's exhibition is the start of the participatory intervention, and it firstly transformed the physical environment of the interior parking space. After the second and third phases were completed, the observation on the follow-up management and maintenance of the project continued. When the 1st phase of the project was finished, the residents felt the community's transformation, and they realized that the community would like to create a better, more liveable public space for them with humanistic care. From that time on, more and more residents started to participate in the activities related to community development. Guoxing Chen, 77 years old, a resident of Dongchang Community, took the initiative in making a tour guide of the exhibition after his self-study on the objects exhibited. In the Charity Night of Lujiazui Coffee Festival 2021, he presented his impressions as a guider at the exhibition of the parking building in Dongchang Community [Fig.3]. Some volunteers also formed an autonomous team in charge of maintaining the environment and interior space of the parking building. Meanwhile, the autonomous team kept diaries to record what they did every day. The enthusiasm, passion, and pride of the residents from Dongchang Community would be seen from all these spontaneous activities. Although the three phases on the physical environment were completed, the residents keep participating in managing and maintaining these shared public spaces.

5. Conclusions

This paper discusses participatory interventions in the old community's public spaces in the Chinese context rather than a Western context. The regeneration in China used to be a top-down affair with strong decision-making powers reserved for the government. The participatory intervention in old community regeneration is a breakthrough from the bottom-up, especially in the Chinese context. It contributes to the global understanding of public space intervention dynamics and widens the case study literature. Although the scope of this paper is constrained within the case study and practices, the public participation in old community regeneration in the Chinese context is an extensive topic that requires further research through other methods. Furthermore, the later analysis should also consider a series of questions, such as how the museum interacts with the community further and how to empower residents to participate more in the operation fields, and this will be conducive to thinking about the sustainability of the soft environment of the old community rather than the physical spaces, in the generalized topic of the sustainable regeneration of the old community.

Fig 3. Guoxing Chen, 77 years old, a resident of Dongchang Community, presented his impressions as a guider at the exhibition of the parking building in Dongchang Community in the Charity Night of Lujiazui Coffee Festival 2021, (photography by the author)

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Improving learning capacity to enhance resilience: the community engagement process in the RI.P.RO.VA.RE. Project

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Abstract

The need of strengthening territorial resilience, reducing environmental and man-made risks while enhancing local potential, appears fully consistent with the fragile dimension of inner areas. However, resilience improvement largely depends on the ability to effectively engage local communities and institutions in the building up of a collective knowledge and a shared understanding of problems as well as in the co-design of innovative solutions aimed at triggering new cycles of life in inner areas. This paper focuses on the role of participatory processes in resilience building, with a focus on the community engagement process developed during the still on-going research project RI.P.ROVA.RE.

Keywords

Inner areas, resilience, community engagement, living lab approach, sustainable development strategies.

1. Introduction

The Italian National Strategy for Inner Areas (SNAI) 2014-2020 defines inner areas as those significantly distant from essential facilities (education, health, mobility) and characterized by critical trends of demographic decline, lack of employment and high vulnerability to natural hazards. About the 60% of the Italian surface is currently classified as inner area, whereas only a quarter of the national population lives there (Barca et al., 2014). Since the adoption of the SNAI, the topic of inner areas gained a central role both in the scientific debate and in public action: the demographic and economic decline of these areas, combined with their increasing vulnerability, required indeed new development patterns aimed both to strengthen local resilience in the face of the multiple challenges that these territories have to cope with, and to enhance their often neglected natural and cultural assets. However, the overcoming of current shrinking trajectories requires a community-based participatory approach capable to develop long-term and place-based development strategies, strengthening meanwhile the sense of belonging of local communities.

To this aim, the RI.P.ROVA.RE project, still in progress, has envisioned a multi-step and multi-actor participatory process addressed to build up an integrated knowledge of inner areas, capable of combining both expert and local knowledge, and to co-design integrated strategies towards a sustainable and resilient development (Galderisi et al., 2020). RI.P.ROVA.RE is the acronym of "Riabitare I Paesi. Strategie Operative per la Valorizzazione e la Resilienza delle aree Interne (Re-inhabiting Villages. Operational strategies for the enhancement and resilience of inner areas), funded in 2020 by the Ministry of Environment (currently of Ecological Transition). The envisioned participatory process and its outcomes in the Matese inner area, placed at the border of the Campania Region, are discussed in the following.

2. The Living Lab approach in the RIPROVARE research project

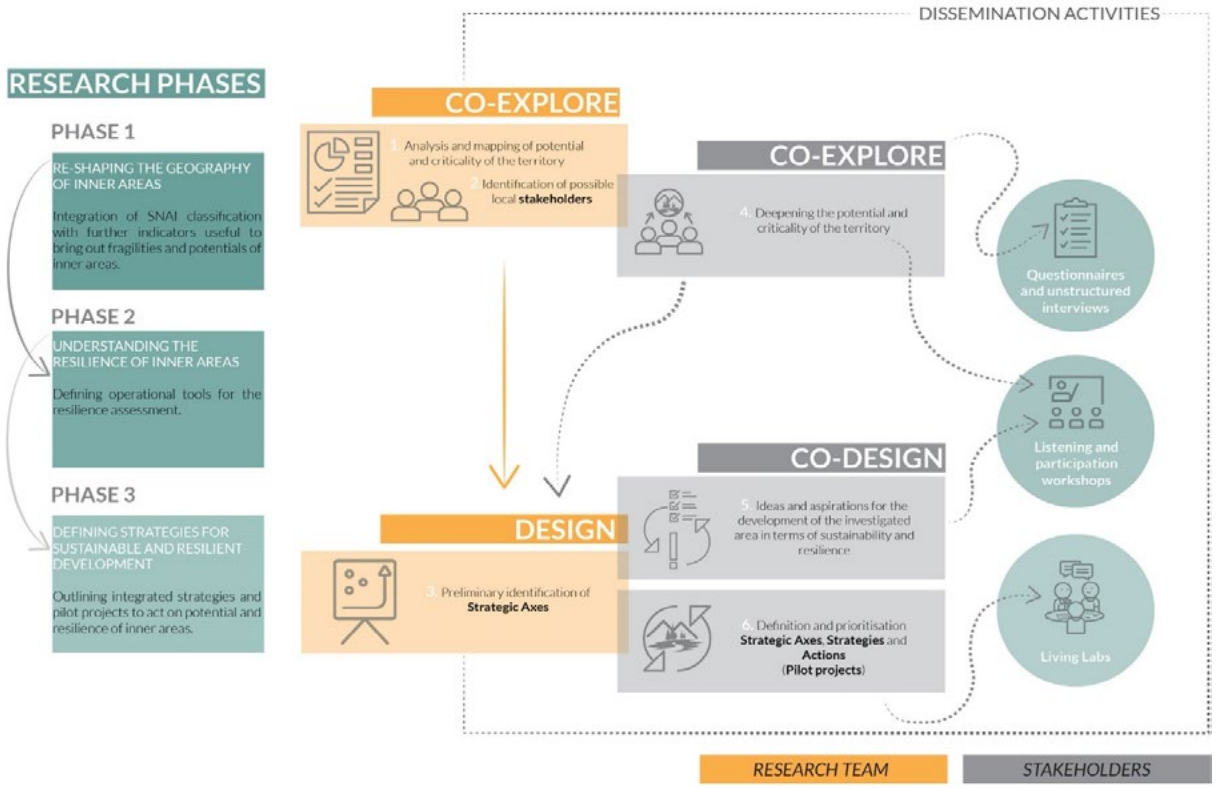

Fig 1. The methodological steps of the participatory process in the RI.P.ROVA.RE Project (RIPROVARE Research Team, 2020)

The concept of Living Labs (LLs) was developed in the early Nineties and was rapidly adopted in different sectors, with a shift from product development to service design (Concilio, 2016). The definitions of LLs are numerous as well as their goals and collaboration formats (Lupp et al., 2021). We refer here to LL as a key approach to build up a collective knowledge, to achieve a shared understanding of problems and to co-design innovative solutions, in which different stakeholders are stimulated to interact pursuing a common goal. According to the Quadruple Helix model (Arnkil et al., 2010), the LL approach requires the involvement of a wide range of stakeholders, including, besides universities, institutions, and firms, also citizens.
Thus, following the LL approach, all the research phases of the RI.P.ROVA.RE Project have been developed through or supported by different dissemination, co-exploration and co-design activities. In detail, the participatory process [fig. 1] allowed involving different stakeholders at different stages of the research project and culminated in the Living Labs, physical environments where local stakeholders have been asked to cooperate in co-designing sustainable and resilient strategies for local development.

3. The participatory process in the Matese area: features and outcomes

The outlined process has been tested on the Matese area, one of pilot areas of the RI.P.ROVA.RE Project, which includes 17 Municipalities and is part of the Matese Regional Park. Most of the Municipalities host less than 2,000 inhabitants and are classified as peripherals by the SNAI because of the significant distance from the service supply poles.
We will focus here on the three main steps of the process: surveys and unstructured interviews, listening and participation workshops, living labs.

Fig 2. The listening and participation workshop at the Higt School "Galileo Galilei" of Piedimonte Matese (CE): Co-design activities (RIPROVARE Research Team, 2020)

Surveys have been mainly administered to representatives of local authorities (Mayors & Deputy Mayors) in order to integrate the territorial resilience analysis: some of the selected indicators to measure local resilience required, indeed, detailed in situ analysis and specific data and information that only local institutions could provide. Meanwhile, the administration of surveys represented an opportunity for unstructured interviews, which allowed the research team to deepen the most critical issues perceived by local institutions and the main actions so far undertaken to address them.
Listening and participation workshops have involved young people (youth forums, high schools), identified as main bearers of local knowledge, needs, and innovative ideas. The workshops represented a key step to raise their awareness on the issues of sustainability and resilience for a balanced development of inner areas,to understand their level of knowledge of the local natural and cultural heritage as well as their sense of belonging to places, and to gather their needs and expectations about the future. Collected data and information revealed a significant lack of awareness about both local natural and cultural heritage and the policies so far implemented at national and regional levels to revitalise inner areas. Moreover, despite the high sense of belonging, most of the participants showed the willingness to engage in the next future professional activities out of their own territory [fig. 2].
The Living Labs involved a wide range of selected stakeholders, including local institutions, entrepreneurs, cultural associations, practitioners, etc., who worked together around three thematic co-design tables, each of them focused on a strategic development axis defined by the research group following the outcomes of previous research and participation activities: innovation of the local productive landscapes, sustainable tourism, housing quality. The co-design tables allowed the research team to better understand strengths and weaknesses related to each axis, as well as to identify and prioritize key goals and related actions. The still on-going activities, based on the outcomes arising from the co-design activities, aim at developing an integrated strategy for the sustainable and resilient development of the Matese area and a pilot project, capable to trigger a development process in the most disadvantaged and least resilient Municipalities.

4. Conclusion

The paper highlights the importance of community engagement in drawing up sustainable and resilient development strategies for the inner areas' relaunch. The multi-stage and multi-actor participatory process outlined by the RIPROVARE project and tested on the Matese area represented a significant opportunity to increase awareness of local community, especially of young people, on sustainability and resilience issues, to build up a shared knowledge, bringing out both criticalities and potentialities of the Matese area, to co-design an integrated strategy for future development. The process itself, which can be easily replicated in different areas, is also a crucial tool to enhance territorial resilience, by improving learning capacity of both communities and institutions: resilience is, indeed, not an asset but a process of continuous change and evolution (Davoudi, 2012), fuelled by the learning capacity, interpreted as the ability to constantly improve territorial knowledge and to learn from experiences implemented both locally and in other contexts.

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To a sustainable redevelopment of illegal settlements

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Abstract

The paper is divided into two parts, the first proposes a consideration on the planning tools provided by the Italian legislation in force to redevelop the illegal settlements characterized by illegal allotments, drawing some critical suggestions from some case law concerning specific territorial conditions. The second part recognizes in some eco-planning techniques the possibility of new planning tools suitable for solving these territorial problems. It identifies some macro-categories of intervention that these tools should use to plan and implement urban redevelopment characterized by a high degree of environmental sustainability of these parts of the territory that were created without an overall and/or systemic logic, an essential prerequisite for achieving a broader and more harmonious sustainable territorial regeneration.

Keywords

Illegal settlements, Urban Planning Tools, Environmental Sustainability, Eco-Planning, Redevelopment

1. Introduction [CdB - SL]

One of the most controversial topics of territorial policies is represented by illegal settlements and the ways in which this phenomenon has been approached in recent decades. The extension it has achieved, especially in southern Italy, calls for a cultural and technical-scientific debate to deepen this process of land transformation (Colombo, Losco, 2011) The problem of redeveloping this built city, beyond the sanctions imposed by legislation on building amnesty, is crucial because of its size and the way it affects the liveability and environmental quality of large areas of our country. The main objective of the contribution is to improve the understanding of the logic of transformation of these portions of the territory (de Biase, Losco, Macchia, 2017).
The results will contribute to the identification of tools and techniques for the re-development of these settlements through the implementation of Eco-Planning theories aimed at achieving greater resilience of these parts of the territory.
The methodology starts with an analysis of the legal and technical rules that regulate the phenomenon and define the urban planning tools for its implementation. The second step is the reading of emblematic cases and of the urban planning tools employed for their re-development, even if not foreseen by current legislation, such as the case study of Orta di Atella (Ce). Finally, to implement ecologically sustainable solutions, Eco-Panning techniques for the re-development of these settlements are proposed as guidelines for the urban planning tools provided by the national and regional laws in force.

Fig 1. Terzigno (Na) - Extract of Municipal Urban Plan, L. Colombo, S. Losco, R. Maccarone. Edges of built-up and unbuilt implementation areas, line in red.

2. Planning tools of illegal settlements [CdB]

First is essential to remark is the difference between informal (Ricci, 2020) and illegal settlements (Berdini, 2010): only the latter are the specific object of this extended abstract. The main difference that we want to underline here relates to land ownership: in the informal city (Ekandem, 2014), land ownership is indifferent, in the sense that the informal settlement is built regardless of the right of ownership of the land; in the illegal city, on the other hand, at least in the first phase of the spread of unauthorized settlement in Italy, there is a close connection between the right of ownership and the practice of abuse, in the sense that building volumes are built illegally on owned land. The phenomenon of illegal settlements, especially if extensive, can also be seen as an undesired or even wanted consequence of the separation between good politics and good town planning, which are united by the pursuit of the priority and superior public interest as an unavoidable objective to manage and plan the correct transformations of society and territory. This is true if illegal development represents the rule of the transformation and/or expansion of territory, while it loses its meaning if the phenomenon represents an exception with respect to the entire settlement of which it is a part. The term illegal development evokes the anomalous use of a resource (land), its exploitation and the practice of those who benefit themselves over an entire community (Clementi, Perego, 1985), as well as a twisted and pathological relationship with urban planning. This phenomenon, which is particularly diffuse in southern Italy, has not been stopped or given a concrete response. Urban planning instruments have played a significant role, since their absence, outdatedness, lack of clarity or total separation from the real development needs of the territory and the inhabitants have contributed to complicating the scenario. Add to this the continuous evolution (confusion) of the legislation has exploded into several plans that have not reached their objectives due to the lack of a necessary mediation between the conflicting interests of the main social and economic forces at play. How can operate in these areas? One tool that can be used is the built-up and unbuilt implementation area (Terzigno-Na) [fig. 1], which, in order to be able to give concrete answers to the current condition of our territories, must...*be aimed at achieving three objectives: the construction of adequate primary and secondary urbanization; the protection of historical, artistic, archaeological, landscape, environmental and hydrogeological interests; the development of a rational*

territorial and urban insertion of the settlement (Coppola, Chiodelli, 2019). Few instruments have been approved in Italy, among them, the most interesting is the case of Rome, which has provided (Zone F1-PRG 1965, Zone O-Variante delle Borgate 1983 and Toponimi-PRG 2008) *a recovery model based on the detailed planning of perimeter areas through the completion of mainly residential sectors and the acquisition of public areas for the construction of equipment* (ivi). Another emblematic example is the situation of Orta di Atella (Ce), which has suggested the drafting of a special **I**mplementation **U**rban **P**lan: the posthumous IUP to be used for the new parts of the settlement already built up, with the aim of constituting the necessary legal preconditions for the partial or total removal of building and urban planning abuses resulting from the unlawful direct implementation of the provisions of the existing plan. The posthumous IUP does not exist under Law 1150/42 or LRC 16/2004 but could become part of the urban planning instruments in a surreptitious way, because of two jurisprudential sentences, one by the Cassation Court (section III, 27/09/2010 n. 34881) and another by the Administrative Court (Palermo Sicilia, section II, 15/10/2012 n. 2008). The posthumous IUP is therefore an emergency instrument, used in cases where there is not a lack of authorization (as in the case, for example, of volumes subject to amnesty), but an illegitimacy of the authorization itself, which occurs when the citizen obtains a Building Permit in a ZTO, for which there was an obligation, which was not complied with, to draw up a preliminary IUP. In view of the exceptional way in which most of the abuses have occurred, the phenomenon of illegal settlements in Orta di Atella (CE) calls for a technical and legal instrument that is also exceptional, going beyond and above the wide-ranging urban planning instruments provided by the laws in force.

3. Sustainable redevelopment of illegal settlements [SL]

Eco-Planning is about planning and implementing a habitat in which technology and nature are merged, human creativity and productivity reach the highest levels, residents' health and environmental quality are well protected, and energy, materials and information are used efficiently, with the primary objective of ensuring the correct performance of human activities. The integration of nature and man-made elements in the spatial planning (Un-HABITAT, 2009) is nothing new. Already in the last century (Howard, 1898-1902, Geddes, 1915) already the importance of the interrelationship between cities and natural ecosystems was clear, suggesting the need to limit the anthropization of the territory to properly manage urban growth. The urban planning instrument established by the legislation since the first building amnesty (Law no. 47/1985) to regularize illegal settlements was the modification (general or partial) of the **M**unicipal **U**rban **P**lan in force aimed at the redevelopment (ivi art. 29) of these built areas, delegating to the Regions the regulation of the formation, adoption and approval by specific laws. Article 23 of Regional Law no. 16/2004 of the Campania Region only partially regulates the provisions of the national law, entrusting the MUP with the delimitation of the existing illegal settlements subject to amnesty. This perimeter, however, regulates the objectives, repeating those already set out in Law no. 47/1985, but not the delimitation criteria. The MUP defines the modalities for the urban/building redevelopment of the illegal settlements, the compulsory interventions and the procedures, including mandatory ones, for the execution of the same, also through the formation of building implementation zones. The MUP can subordinate the implementation of urban and building redevelopment interventions on illegal settlements to the drafting of special IUP, called **I**llegal **S**ettlements **R**edevelopment **P**lan for, whose formation procedure follows the rules of the implementation regulation provided for by art. 43-bis. In the regional legislation of Campania, there are therefore three tools to be applied to solve the problem of illegal urban development: the modification of MUP at general municipal planning level, the ISRP and/or the building implementation area at executive planning level. Where illegal urban development represents and embodies the rule of expansion and/or dominant transformation of the territory, a technically relevant solution can be pursued at the general urban planning and/or implementation scale. There is no doubt that this illegal heritage is a condition for drafting new MUPs, so that it can be redeveloped and become a fully-fledged part of the city to which it belongs; to this end, it is useful to identify environmentally sustainable guidelines for drafting these instruments. Eco-Planning applies state-of-the-art techniques to plan and implement transformation interventions that have a sustainable impact on the environment by intervening on water, urban density and form, mobility, biodiversity, waste, soil, energy, and the reduction of greenhouse gas emissions, which can guide the drafting of both MUPs (like zone Br of Terzigno) [fig. 2], building implementation zone and ISRP for the sustainable redevelopment of illegal settlements.

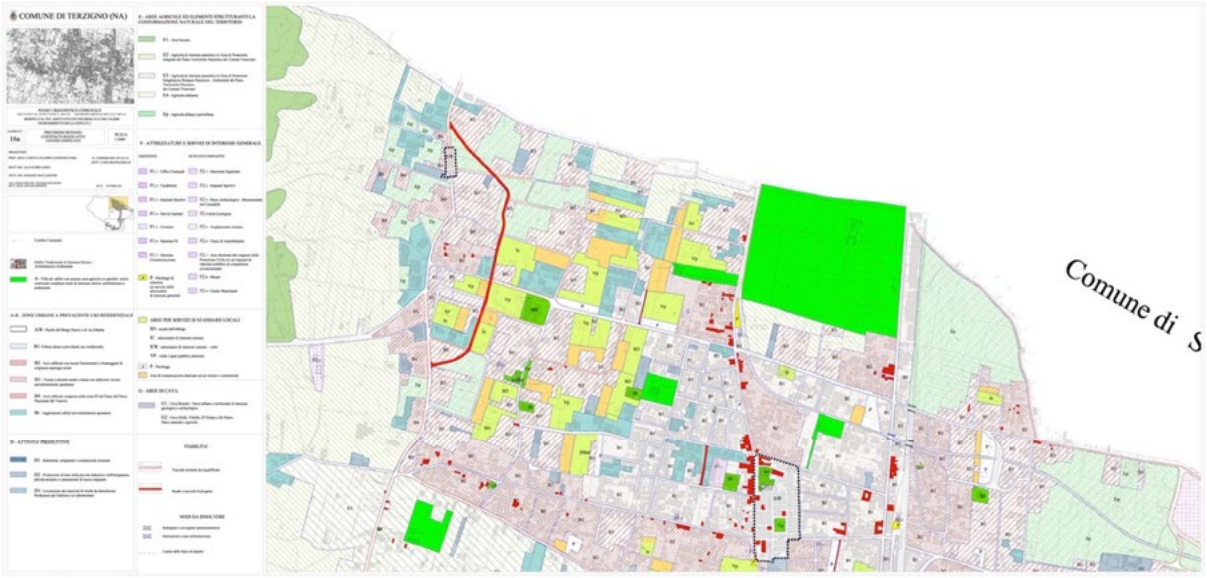

Fig 2. Terzigno (Na) - Extract of Municipal Urban Plan, L. Colombo, S. Losco, R. Maccarone. Zone Br - illegal built-up settlements, shaded in light blue.

Sustainable redevelopment guidelines must provide for the implementation, integration, improvement and redesign of:
- primary urbanization works pursuing the maximum environmental sustainability through the application of water sensitive urban design techniques, the extensive use of slow and/or collective mobility, the integration of energy plants to the local network and to the supra-municipal sector networks, the provision of data networks in coherence with the urban and social morphology;
- secondary urbanization works providing urban arrangements capable of improving the local microclimate by reducing the urban heat island effect;
- settlement fabrics with high residential and/or productive and/or mixed density to limit soil consumption in areas not yet urbanized, to reduce land take, to limit soil sealing, to connect and integrate these settlements with existing consolidated ones;
- configuration of settlement fabrics and performance of the building stock to reduce vulnerability to territorial risks (seismic, hydrogeological, volcanic, technological), energy consumption (construction of nZEB constructions) and and waste production;
- morphological quality of the urban and natural landscape also from the point of view of environmental qualities.

These guidelines can be framed within the wider background both of disciplinary tradition of *Progetto di suolo* (Secchi, 1986) and in the new Eco-Planning theory and techniques (Yeang, 2009. Yang, 2013. Forman, 2014).

4. Conclusions [CdB - SL]

The relevance and interest of the proposed topic is related to the extent and diffusion of the phenomenon of illegal settlements, and to the employment and development prospects that a planned redevelopment would be able to offer. Some reflections may be useful for the development of new technical and legal tools for urban regeneration based on Eco-Planning and public-private partnerships. Several issues remain to be explored, such as: the assessment of environmental damage and compensation, the reduction of land consumption and the mitigation of territorial risks, the overcoming of the separation between sectoral regulations (construction, urban planning, landscape, taxation, and private law), all of which have a heavy impact on the coordination between construction, urban planning, land protection, and territorial and environmental taxation, to name but a few.

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Spatial Planning and Energy Transition: The role of public participation

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Abstract

In recent years, the global effort to address the causes and impact of climate change has called for energy transition in which Renewable Energy Systems (RES) occupy a key role. RES location is not without problems, as they cause a significant impact on the human and the natural environment that affect their public acceptance. It is in the same context that the role of spatial planning is decisive not only for location choices but also for the coordination of various activities. It is important that choices made by spatial planning are not only well documented but also publicly accepted. Public participation in decision-making about energy transition at the local level appears to be influential in protecting the human and the natural environment and finally, in public acceptance of RES. This presentation examines the parameter of public participation in decision-making about RES and energy transition in general and seeks to identify the role of spatial planning in this.

Keywords

Spatial Planning, Energy Transition, Public Participation, Public Acceptance, Democratic Transition

1. Introduction

As the efforts towards climate mitigation and adaptation progress rapidly from rhetoric to action, RES concentrate the bulk of action on de-carbonization and the reduction of GHG emissions. Energy transition and RES are not without problems though, as they affect the environment, land, and landscapes. Thus, the need arises for Sustainable Transition (Picchi et al., 2019) that considers land uses and ecosystem services. In some European countries with a long tradition in spatial planning, the effort towards energy transition places emphasis on local level planning and public participation through well-organized public consultation. Thus, it is interesting to examine the role of citizens and stakeholders in spatial planning for decision-making about RES and energy transition in general. From the viewpoint of spatial planning, it is interesting to examine its ability to address the pressing needs for energy transition, and especially for RES location at the local level, as well as the role of participatory spatial planning.

2. Public participation in energy transition

Public information, consultation and participation is critical for decisions about the location of various activities with environmental impact. The UN Economic Commission for Europe has set the framework through the Aarhus Convention “on access to information, public participation in decision-making and access to justice in environmental matters” (1998), while the EU has been a party to the Convention since 2005. According to Uittenbroek et al. (2019), public participation in environmental decision-making is beneficial in terms of social acceptance and support of a decision as well as in terms of gathering local knowledge and promoting social learning. However, participation is not without problems when, for instance, societies are given the opportunity to share their views although they are ultimately ignored. Sometimes, participation is limited to the one-way flow of information to convince

the audience of a particular project or place. An anti-democratic form of participation ultimately has more negative consequences (Steg et al., 2015; Stober et al., 2021).
Even though citizens' awareness regarding GH emissions has led to a positive stance about RES, concerns are raised about the sitting of various types of RES. Therefore, it is important for societies to be involved in the decision-making process, to feel that their opinion is taken into account and that this process is fair (Steg et al., 2015). Liu et al. (2020) point out that the acceptance of a project is higher when people perceive the decision-making process as fair. Regarding RES, a growing trend towards community-based RES emerges. The model of ownership is critical in increasing acceptance as is for instance, the case of Energy Communities (Bidwell, 2016; Ek & Persson, 2014). In some cases, residents take on an essential role and become producers, consumers, and owners of RES projects. In Germany, this factor was the driving force behind the growth and expansion of energy production from RES (Fraune, 2015; Haas, 2019). Municipalities in Germany participate in more than half of energy communities thus enhancing local governments and citizens' participation in energy transition as well as in shaping local energy policies (Schmid et al., 2020).

3. Spatial Planning and Energy Transition

Without proper planning, energy transition can turn into a situation with negative effects on land, landscape, nature, and the wider environment (Toskas-Tasios & Thoidou, 2021). Since spatial planning interacts with climate-related policies and energy transition at the local level, public participation in spatial planning is crucial for the planning of energy transition. Following Suškevičs et al. (2019), spatial planning can support sustainable use of RES and enhance their acceptance by includig participatory methods. The spatial level of planning is important, as it is not possible to process a centrally designed transition in the same way in every location. The role of local government in developing effective policies for energy and environmental issues is crucial (Fudge et al., 2016), while it may be more innovative and more responsive to local conditions and environmental preferences than national governments (Lutsey & Sperling, 2008). Since 2006, the SEA Directive has given a boost to promoting public participation in spatial planning. The aim is twofold: to contribute to transparency in decision-making and to ensure thatthe information provided is "comprehensive and reliable".
Following an ESPON study by Nadin et al. (2018) territorial governance, together with spatial planning, can support other policies such as energy policy to increase their acceptance, as they contribute to closer relationships with citizens, democratic legitimization of participatory processes and experience gaining for balancing contradictive environmental, economic, and social objectives. Among 32 European countries examined in this ESPON study, a lack of integrated policies and coordinated measures at the national and sub-national level has been noticed (Nadin et al., 2018).

4. European trends and evidence from Greece

In more and more countries such as Denmark, Germany, Sweden, and Finland, energy transition is organized in a decentralized way, with increased citizen participation. This relates to the level and competencies of spatial planning. The case of Sweden is representative of the role of local governance and citizen participation in comprehensive spatial planning that addresses energy transition. For instance, in a comprehensive municipal plan, areas suitable and unsuitable for wind energy are often identified (Boverket, 2018). Each municipality has an energy plan which cooperates with the municipal spatial plan in terms of energy and climate goals. This highlights the relationship between spatial and energy policies and integrated planning as a tool to mitigate climate change (Wretling et al., 2018). Despite the heterogeneity of plans in Swedish municipalities, it is worth noting that the more recent the municipal plans, the more they seem to incorporate aspects of climate change mitigation into spatial planning (Wretling & Balfors, 2021). Finally, Swedish municipalities can block wind energy projects, as a veto on wind investments was introduced in 2008 (Lauf et al., 2020).
Based on an analysis of the Swedish system, Koglin & Pettersson (2017) highlight the political dimension of decision-making, arguing that sometimes planning is guided by ideas primarily led by private interests. This neoliberalization of the planning system tends to transfer powers from planners to politicians. In small municipalities that lack planning and evaluation capacities, a type of commercialization of the planning process is taking place, as this task is conferred to private consultants (Koglin & Pettersson, 2017). However, potentialities of local level planning are not reduced, as local authorities are in a preferential position to trigger the local community's participation in planning and implementing climate-related policies (Fudge et al., 2016).

In the case of Greece, RES location is primarily addressed by the national level Special Spatial Planning Framework for RES (2008), which seeks to mitigate the effects on land, landscape, natural environment, and productive activities by providing directions, rules, and restrictions. Spatial planning in Greece is highly hierarchical, structured at three levels: national, regional, and local, with increased planning competencies of central government (Nadin et al., 2018). Such a structure can lead local communities away from planning and decision-making processes. The role of local planning is limited as Local Urban Plans are either not recent, or may not exist, or even if they do exist, they do not carry out specializations or proposals in the direction of the necessary energy transition and RES location. This concentration of planning powers at the central government, may deter local communities from participating in planning and decision-making. The Bee Green Research Group (2021) finds a lack of consultation and participation of local communities in both the process of drafting the spatial planning frameworks and the authorization procedures for RES projects. Overall, the following forms of public participation in the various fields of planning can be identified:

- Consultation with the public is an indispensable part of the SEA of any spatial plan or spatial development program since 2006.
- The OpenGov platform is a national-level framework for public consultation established in 2009 for promoting transparency.
- The Landscape Convention sets some rules for public participation which are incorporated into Regional Spatial Planning Frameworks.
- The “Municipality Consultation Committee” has been established in each municipality since the 2010 local government reform in Greece.
- Public consultation has been implemented in an informal way in several cases, mostly at the local level on the initiative of regional level professional and scientific bodies as well as of local environmental movements.

5. Concluding remarks

As the request for a fair and socially acceptable transition is raised, the social factor and public acceptance is recognized as a key dimension of energy transition. Public participation in planning decisions can promote a better process and outcome of RES sitting and improve their public acceptance and overall performance. As is revealed from countries with decentralized planning systems, the structure and organization of spatial planning in supporting participatory processes is critical. In the case of Greece, concentration of spatial planning competences at the national level leads to limitations in the role of regional and local planning in decision- making about RES location and spatial organization of energy transition, which in turn reduces the potential of public acceptance.
It appears crucial that public participation in decision-making about energy transition and RES be promoted by various means, such as strengthening overall participatory processes in planning, promoting structured consultation procedures at the local level either formally or informally, utilizing existing platforms and means such as OpenGov and various ICT tools, supporting Energy Communities development, and utilization of good practices such as local referendums and vetoes and at the same time, face-to face procedures at the local level.

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Risk-connect: a secure and ecological path in the east side of the Vesuvius National Park

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Abstract

The protection and safeguarding of the landscape / territory - especially the vulnerable one, in line with the goals of the "Agenda 2030" and with the "Sendai Framework", needs policies that implement sustainability and resilience, with intent to adopt multi-level planning strategies that turn their attention to the issues of mitigation and adaptation, with the aim of reducing the negative impact (victims, economic damages, eco system damages, ...) linked to disasters / risks that they can occur on weak territories / landscapes. The contribution underlines a strategy capable not only of enhancing the territory and implementing sustainable tourism within the Municipality of Terzigno, which extends over part of the eastern slope of the Vesuvius National Park, but of adopting a series of strategies for securing of an extremely vulnerable and exposed landscape, in addition to the well-known volcanic and seismic risk, also a hydrogeological and fire risk.

Keywords

Vulnerable landscapes, multi-risk, ecological connections, safe paths, slow mobility

1. Introduction

The theme of the landscape project for vulnerable territories is addressed here by examining the case study that focuses on the possibility of a new safe and sustainable connection (Banister D., 2008) of the Vesuvius National Park and on a new system of enhancement of the territory and safety measures in the Municipality of Terzigno that extends to the slopes of the same Park.
The re-functionalization and conversion of the railway line Torre Annunziata – Cancello, into a tram network, which passes through the analyzed municipality, becomes the node for having a sustainable road system that branches off inside the Park.
The recovery of the Terzigno station, as a place for hosting a "Volcanological and Geological Museum", has the social purpose of disseminating knowledge related to the risks about the complex Volcanic system (Curci F., 2020) and showing its geological complexity, which occurs in Cava Vitiello, a place designated to become an open-air geological museum.
The seismic safety of the buildings that are along the escape routes (Zuccaro G., 2014); the possibility of reducing the hydrogeological risk through a system of rain gardens and the provision of some recharging points for small electric vehicles, become a connection system that leads to the “New Park Gate”. This, located on the slopes of Vesuvius, performs multiple functions and also becomes a valid sighting place in case of fires. Finally, the need to diversify the flow towards the Gran Cono path, the implementation of the tourist offer, arranging a mountain hut at an altitude of 700 m and the desire for a "forest restoration" (Cardiello G.,2021), become an opportunity to draw up an abacus of reference for addressing the hydrogeological risk in a protected and vulnerable area.

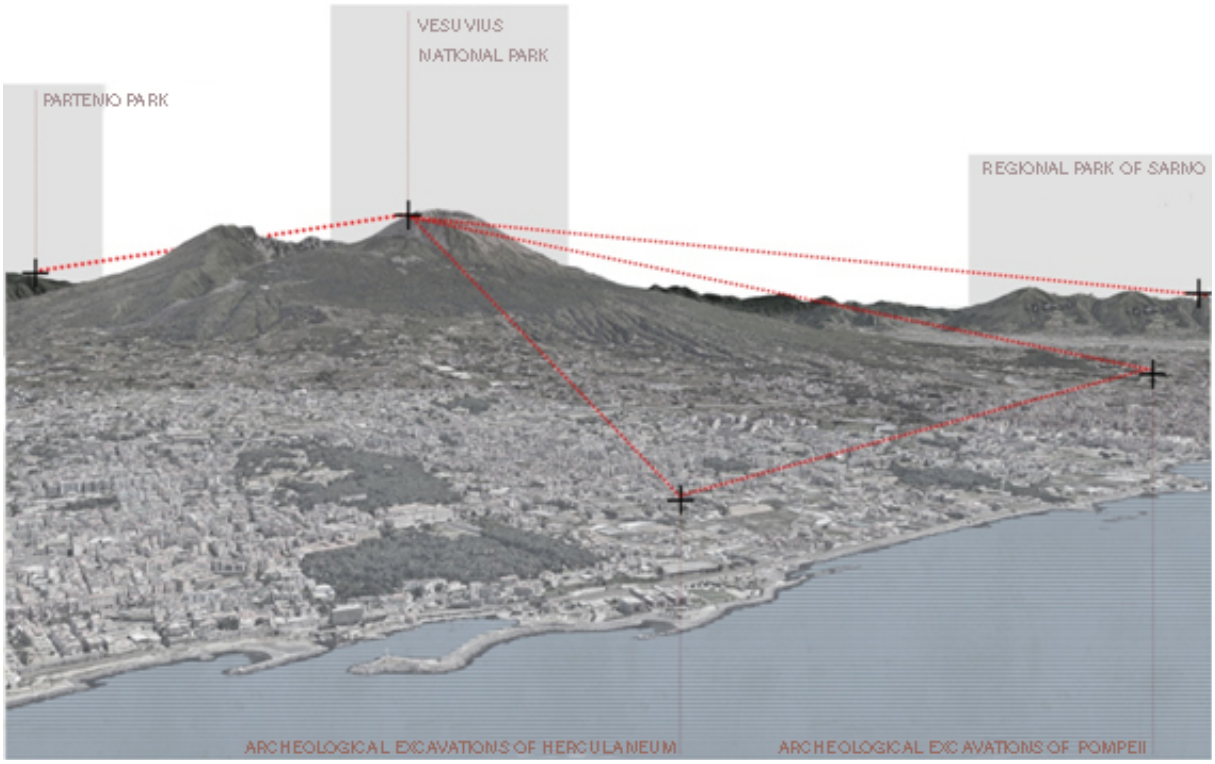

Fig 1. Territorial relation of Vesuvio National Park (Della Corte, Di Lorenzo, Landi, Sorbo, 2021).

2. A landscape to protect

In a territorial vision, which identifies from above the great system of Mount Somma Vesuvius within the territory that towards the sea embraces the Gulf of Naples and inside the land goes towards the Apennine chain, the strong landscape correlation appears evident and tangible. of the complex volcanic system Monte Somma-Vesuvius with surrounding mountain systems. This, National Park since 1995, is placed in a central position respect to the nearby regional mountain, becoming at the same time an hub that establishes a continuous relationship with the territory with which it relates. At the same time, these continuous relationships, this visual and perceptive dialogue that "determine the general shape of the city" (Gyorgy Kepes) and of the natural territory that it connotes, the same territory-landscape that is vulnerable, even where the same is exposed to multiple risk factors. Furthermore, although the Park is characterized by multiple richness, it denotes partial accessibility (Lanza, 2016), and therefore a sectorial use, which makes path 5 of the "Gran Cono" more accessible, determining implications on carryng capacity, defined as the number of people sustainable for an ecosystem (Amadesi.G., Mereu C., 2000) so that the element that constitutes the tourist attraction is not put at risk (Manenete, 2004). This highlights the need for a greater capillarization of the access points to the Park capable of orienting its enjoyment and its practicability.

3. Tramway network and “Geological and Volcanological Museum” station.

The project for the refurbishment of the disused railway network, which starts from Cancello and arrives at Torre Annunziata station, aims to connect the Partenio Park with the Tyrrhenian coast, encouraging the use of public transport. Furthermore, the possibility of converting the railway network,involves the reduction of greenhouse gases, benefits to the social system and economic advantage for the territory. Inside the Terzigno station, two measures are planned that insist on pre-existing buildings, fulfilling, among other things, the museum function, with the aim of raising awareness and educating the resident population on the volcanological phenomenon, on expected damage and on the importance of structural adaptation of buildings.

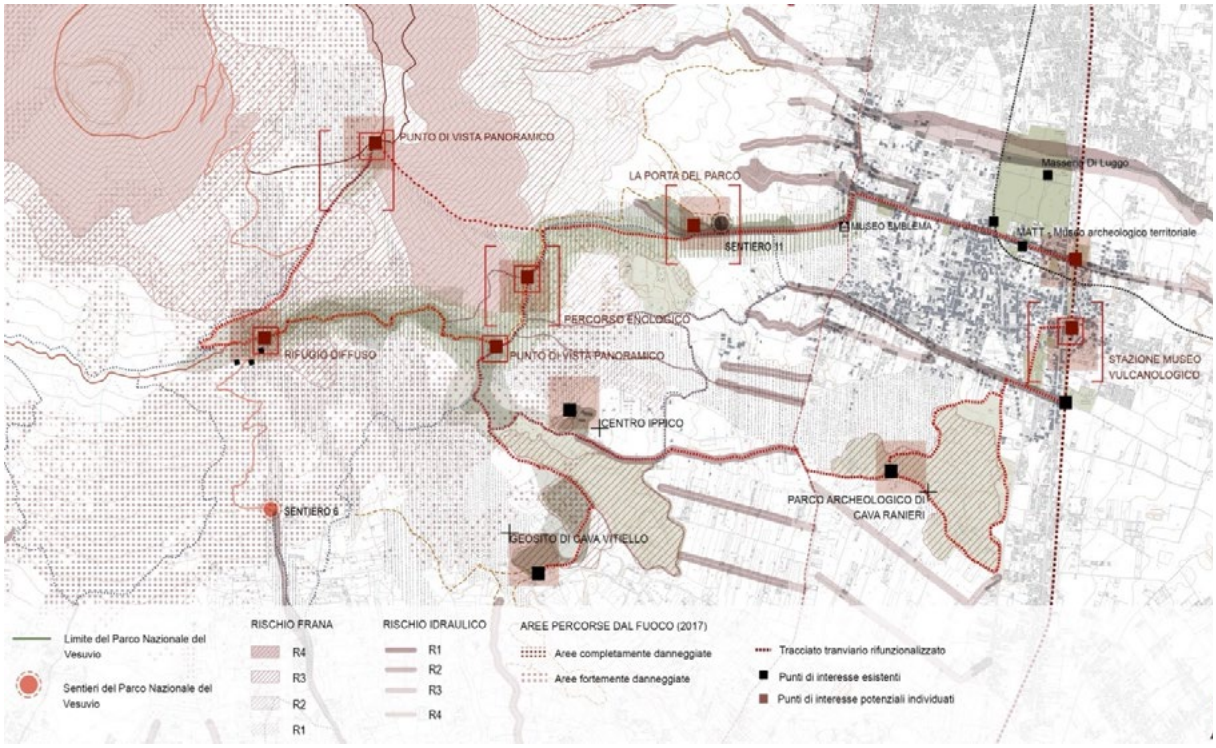

Fig 2. Risk map and project strategy. The image shows the risk present within the municipality of Terzigno (landslide risk, hydraulic risk, areas covered by fire) and the project strategy (Della Corte, Di Lorenzo, Landi, Sorbo, 2021).

4. Escape routes: a safe and sustainable road system

From the elaboration of the escape routes indicated by the Civil Protection Evacuation Plan and the data provided by the PLINVS study center, it was possible to indicate which routes to make safe in case of a volcanic and seismic risk. The seismic adaptation of the buildings facing the escape routes, the consolidation of the roofs, the provision of pitched roofs and other measures, become guidelines within a drafting Urban Plan, to allow for safer roads. Furthermore, the provision of a large area near the "Giusti" school accessible to public transport, becomes a Park in times of peace, while in the event of an alert it offers a safe shelter equipped with a refreshment point and an information point of the Civil protection. Rain gardens and canalization systems become the answer for securing hydraulic risks and for implementing biodiversity, where the escape routes are also roads that lead to the paths of the Park.

5. The “Gate of the Park”

The "Gate of the Park" is a new access gate to the ski lift path inside the Park. This fulfills a series of basic functions necessary for the management and reception of tourist flows, hosting an info point, a coffee shop and a refreshment point. A security system capable of monitoring a part of the natural site offers the possibility of controlling the fire risk by activating warning systems. The new “Porta”, which is located near the pre-existing path 11, is placed on via vecchia Campitelli, retracing a historic municipal route. This path, through the re-functionalization and insertion of some water containment tanks and canal construction, provides valid solutions for the mitigation of hydrogeological risk, while in peacetime become a playground, such as water square experiences in the Natherlands. In addition, on the edge of this road network, the insertion of native plants is envisaged, based on the reflections of the studies carried out by the University of Agriculture. A cycle path and charging points for small electric vehicles become possible alternative recovery systems within the Park.

Fig 3. From risk to safe and nature-based solutions. In order of representation from left to right: the widdespread refuge, the natural skywalk, the Vineyard, the “Gate of the Park”, the Volcanological Museum (Della Corte, Di Lorenzo, Landi, Sorbo, 2021).

6. Forest restoration: the vineyard and ecological reconnection.

The paths, that connect from the tramline to the paths of the Park, constitute real moments of knowledge of the territory, crossing historical, geological and archaeological emergencies. The new path instead focuses its attention to the Vesuvian agri-food specificities. In a vision of multiple redevelopment of the territory, the need to restore the soils dedicated to agriculture, partially abandoned after the fire in 2017, is highlighted. The need to reintegrate local crops has not only the value of perpetuating the vocation of this land with local products (grapes for the production of the wine, “piennolo” tomato,…), but also of connoting a different landscape vision more identifying the place, in addition to make the soil less subject to fires and erosion. This strategy is completed through a partial reforestation of the area, where the fires have caused extensive damage. The partial reforestation of the area, as suggested by the studys of the Agricultural University, is completed with the inclusion of native plants (manna ash, phillyrea, strawberry tree, downy oak, ...), where the fires have caused extensive damage. In addition, double piling, drainage holes, drainage channels and “rompitratta” are systems compatible with a protected area and used for the safety of the path, while identifying a reference abacus for the Park area.

7. Stopping points and slow-mobility.

In adaptation to the Masterplan of the "Great Vesuvius Project", inside the path, technological stopping places have been identified capable of allowing the recharging of electric transport vehicles, as in the case of Lake Maggiore, and so on. Some researches have highlighted the possibility of using low- impact technologies, which due to their resistance to atmospheric agents and the lack of trenches for fixing, are compatible with the rules of the Park. The paths, in addition to extend the goal of expanding the network of existing paths and connecting with the pre-existing ones, give the oppotunity of greater usability and enjoyment of the Vesuvian landscape. The project paths offer natural open space and skywalks, based on the experience of “Pas dans la vide” in Chamonix.

8. Results

The strategy of a redevelopment on a multi-risk and complex territory such as Vesuvius, must necessarily be articulated on multiple fronts, expecially if the aim is the safety of inhabitants and the environmental sustainability. The possibility of incompleteness of the strategy, would still be able to give an effective response, configuring a more resilient territory, capable to respond in case of risk (hydrogeological, volcanic or related to fires). Certainly, from the point of view of territorial connection, the possibility of reactivating the railway line and its conversion to a tram network, is a focal point of this intervention. Despite this, without this intervention, it is possible to encourage other mobility systems. The importance of the museum function, as tool of dissemination of information, just as it happens in the museums of memory (Jewish Museum in Berlin or the 9/11 Museum in New York) offers the possibility of a schooling at a territorial level, which is necessary for the protection of humans lives and for the protection of the landscape. In addition, it is important to note that each strategy has the possibility of functioning individually, bringing benefits in econsystemic and safety terms, as well as guaranteeing a diversification of the tourist flow towards the Vesuvius Park and the redevelopment of the municipality examined. Furhermore, it is possible to activate partnerships between public and private sectors,

examined. Furhermore, it is possible to activate partnerships between public and private sectors, expecially in the agricultural one, such as some important local wineries. This possibility would lead to implement responses within the market, certainly bringing multiple benefits.

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Piano Nazionale di Ripresa e Resilienza, 13 luglio 2021

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Cultural Heritage in Resilience Planning: Evidence from 100 Resilient Cities Database

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Abstract

Cultural heritage, as a container of accumulated experiences, connects past, present and future by transmitting knowledge to future generations through tangible and intangible assets. Sustained cultural assets accommodate the traditional knowledge proven historically through successes and failures against disasters. Hence, cultural heritage can contribute significantly to community resilience if considered systematically in planning processes. Yet, there is still a lack of emphasis on cultural heritage's role in enhancing resilience. This paper analyses the strategy documents presented in the 100 Resilient Cities Program. Accordingly, six different approaches towards cultural heritage stand out in current resilience strategies: ignorance, economic development tool, identity construction, social component, physical integration tool, comprehensive consideration. This study concludes by suggesting that cultural heritage can further support community resilience by learning from past experiences, revisiting locally embedded knowledge and traditional practices, and ecological conservation.

Keywords

Resilience, Community Resilience, Cultural Heritage, Heritage Resilience, Resilience Planning

1. Introduction

Today, human communities living in urban and rural settlements are under the impact of diversifying risks, which became increasingly challenging to cope with; and result more frequently in shocks and crises that highly disturb them. The rising risk environment brought about a new approach towards city and regional planning: resilience planning. Resilience planning aims at making cities, regions and their communities prepared for unexpected or projected threats; enhancing their capacity to cope with crises; get adapted to changing conditions while availing themselves of development potentials (Altay-Kaya, 2019; Altay-Kaya, 2021). In this prospect, learning from former experiences and learning from the past, that is making use of the inherited local knowledge, are critical inputs for resilience planning. This is where cultural heritage may reveal its true potential for resilience planning.

Cultural heritage, as documents of the history of humanity, refers to the existence of cultural identities and sense of belonging, by compromising bonds of humans with their physical surroundings. Existence of these bonds is based on a cultural accumulation formed since pre-historic ages, which can be represented by various tangible and intangible, movable and immovable cultural assets. In that manner, the definition and scope of cultural heritage have been developing by means of all forms of traces of cultures including archaeological findings, historic buildings, traditional tissues, modern built-environment, customs, production modes, handicrafts, narratives and so on. This broad concept of cultural heritage includes historical layering of knowledge through time. In fact, cultural heritage, as a container of numerous accumulated experiences, represents the connections between past, present and future by transmitting the validated knowledge to future generations. This accumulation enables communities to learn to harmonise with nature. Sustained cultural assets accommodate the traditional

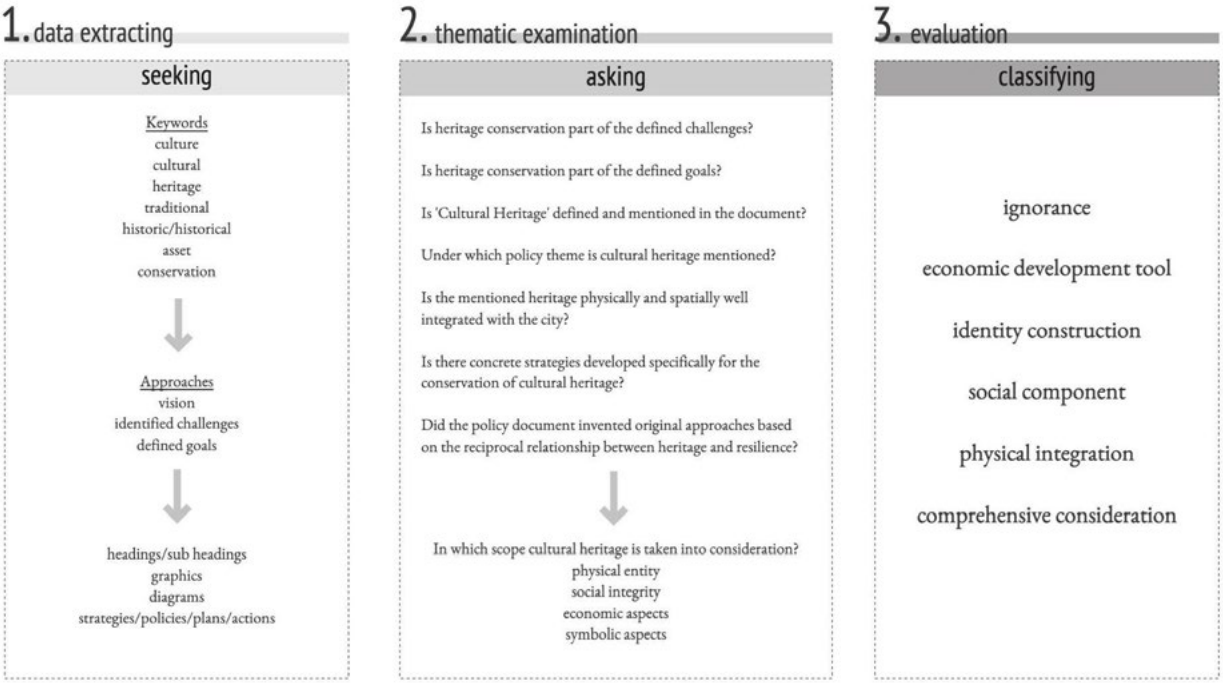

Fig 1. Framework of Analysis (Prepared by the authors)

knowledge, enrichened through the cumulative successes and failures against disasters. Heritage plays an essential role in the social, economic and cultural identity/formation and functioning of communities and settlements; hence, it is a vital dimension for community resilience. However, its potential contribution to other development dimensions is undervalued and neglected.

Although the literature on cultural heritage increasingly highlights the necessity to include cultural heritage within resilience strategies (Fabbricatti et al., 2020; Holtorf 2018; Iavorone et al., 2019; Vafadari et al. 2015), there is still a reluctance in defining cultural heritage as a component of resilience. With this aim, this paper seeks gaps in current resilience planning practices by analysing existing approaches towards cultural heritage in urban resilience strategy documents published in the former 100 Resilient Cities Program database since it covers the resilience plans of various cities with indigenous cultures and creates a legitimate framework for resilience.

2. The Role of Cultural Heritage in Resilience Strategies

The *100 Resilient Cities* Program was formerly a project of The Rockefeller Foundation, which had started in 2013. The programs' aim is to create an opportunity to resilience building against social, physical and economic challenges of the century (URL 1). It seeks to establish a global network of cities and provide resources in building resiliency strategies. Until 2019, 74 cities had published their resilience strategy documents online (URL 2). Due to the interruption of funding by The Rockefeller Foundation in 2019, the database is currently available within the *Resilient Cities Network* website (URL 3). The presented research aims to identify prevailing approaches regarding cultural heritage in urban resilience plans. The research is composed of a three-staged content analysis examining the urban resilience strategy documents published in *Resilient Cities Network database*. The overall framework of analysis is presented in Figure 1.

The first stage (data extracting) aimed at extracting all information related to cultural heritage within the documents by seeking certain keywords and basic approaches. In this framework, we initially searched for the keywords; culture, cultural, heritage, traditional, historic/historical, asset, and conservation in the documents. Secondly, we have skimmed the overall documents' vision, identified challenges and defined goals to release any approaches towards cultural heritage. In doing so, we sought headings,

sub-headings, graphics, and diagrams where strategies/ policies/ plans/ actions directly related to cultural heritage, conservation, or use of traditional knowledge are available.

The second stage (thematic examination) aimed at evaluating the prominent approach of the plans towards cultural heritage. Accordingly, we have evaluated the gathered data in relation to the predefined thematic questions presented in Figure 1, stage 2. These questions inquire whether cultural heritage is part of the identified challenges or goals, whether it is directly referred in the document, what the thematic stance towards cultural heritage is, the level of integration with the city and community, existence of specific conservation strategies and original approaches on heritage and resilience relationship. Main objective of asking these questions is to reveal the scope of cultural heritage related strategies, policies or actions.

Within the framework that has been presented by the second stage, the third stage (evaluation) aims at classifying the way resilience strategies address cultural heritage. Accordingly, we have grouped resilience strategy documents in six categories, differing in scale, emphasis and level of consideration in the inclusion of cultural heritage in resilience strategies as can be seen in Figure 1, Stage 3. The first group, *ignorance*, consists of 45% of strategy documents, which scarcely developed any goal or principle regarding cultural heritage. The second group includes the documents that put economic growth in the centre of cultural heritage approaches. These documents mainly aim at increasing touristic activities to create both a driver sector and employment opportunities. Relatedly, cultural heritage is considered as an *economic development tool*, and renovation-refurbishment-rebuilding actions are at the focus of interventions. The third group, named as *identity construction*, includes documents that approach cultural heritage as a source for cultural identity. Accordingly, developing and strengthening cultural identity needs specific attention on preservation of cultural heritage. Documents that developed strategies towards cultural heritage by aiming at achieving social resilience forms the fourth group: *social component*. Documents in this group introduce principles mainly focused on creating awareness, promoting local culture, integrating educational programs and so on. In certain documents, intangible cultural heritage is brought forward by enhancing social connections with cultural traditions, customs and handicrafts. As the fifth group, several resilience strategy documents consider cultural heritage as parts of more general decisions regarding urban systems by emphasising their *physical integration*. Connection of cultural assets and sites to certain parts of the city by means of transportation networks and green systems was aimed in these documents. Besides, cultural heritage were included in waste management strategies and energy efficiency implementations. The last group consists of resilience strategy documents that developed a *comprehensive consideration* of cultural heritage by approaching them in multidimensional and extensive manners, including economic development, community engagement, protection of culture, social cohesion, empowerments of community members, cultural identity and other general principles regarding urban systems in a comprehensive way. This last group constitutes only 7% of the documents.

According to these identified approaches within the analysed urban resilience strategy documents, we cannot discern a systematic consideration. In fact, the majority of cities, including significant cultural centres such as Paris, have no specific focus on cultural heritage in their resilience plan. Treating cultural heritage only as a tool for economic development, on the other hand, is problematic due to not taking heritage values and social components of cultural assets into consideration. Although conservation of cultural heritage is a value-based process, and economic value is considered as important as socio-cultural values, sustainability of cultural heritage relies on the existence and togetherness of both concepts. Besides, tourism is not the only solution in the provision of economic benefits. On the contrary, local handicrafts, custom productions and traditional economic activities can provide certain opportunities for the local economy to become a part of the economic development. In order to benefit fully from the potentials of cultural heritage in building resilience, the identity construction, social component and physical integration approaches should be held simultaneously. Hence, cultural heritage should be considered in a comprehensive way. As included in the documents of the last group, seeking a comprehensive consideration is quite enlightening in terms of developing an approach towards specifying the role of cultural heritage in resilience planning. In fact, resilience strategies of only five cities can contribute to the literature on this issue, and their analysis in practical manners will be useful in creating a basis for further studies.

3. Conclusion

There is further need to elaborate in detail the different ways in which cultural heritage contributes to resilience. In the light of recent literature, we suggest that the role of cultural heritage in the process of making cities and communities more resilient can be enhanced by two main considerations. Conservation of cultural heritage should be an aim *per se* in resilience planning, and cultural heritage should be considered comprehensively in resilience planning processes for their potential contribution in terms of knowledge and technique, and their role as social catalyst. Within such a framework, policies regarding cultural heritage should be included in all dimensions of resilience planning, rather than simplifying it as a sub-dimension. In terms of the proposed conceptualisation of its contribution, an integrated approach relating "learning from past" and "physical components" to social and physical dimensions, "conservation of ecology" to environmental dimension, "recovery" with the social dimension, and "economic development" to the economic dimension. In this manner, the sustainability and existence of movable/immovable and tangible/intangible cultural heritage is crucial in making cultural heritage "an active component of urban resilience" (Jigyasu, 2019). Thus, conservation of cultural heritage becomes a significant concern in resilience planning, which needs particular attention in awareness-raising at the individual, community and institutional levels.

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A framework for socio-ecological urban co-design: Lessons from two urban parks in the Atacama Desert

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Abstract

With the urgency to adapt cities to climate change impacts, a collaborative approach to design can play a crucial role in integrating public, private, and citizen actors. This study posits that co-design can improve the context-specificity of the projects when the actors contribute knowledge and values to such processes. The question is how urban co-design contributes to integrating socio-ecological knowledge? We propose a framework to analyze urban co-design. We study two urban park design processes in the Atacama Desert. Findings suggest that a co-design approach to the socio-ecological dynamic and physical components of public spaces may improve their context-specificity and suitability. The framework may be useful to conduct co-design processes, as well as to plan them.

Keywords

Co-design, socio-ecological systems, public spaces, urban transformation, urban co-design.

1. Introduction

In recent years, urban settlements are facing multiple social and ecological challenges, and urban transformations need to be undertaken around the world (Webb, Elmqvist, et al., 2017). Some have conceptualized cities as socio-ecological systems (Berkes, 2017; Biggs et al., 2021), and suggest that to foster context-specific initiatives social and ecological parties should be considered in urban design processes (Hooimeijer & Maring, 2018; Webb, Elmqvist, et al., 2017).

Public spaces are the urban spatial voids where life unfolds and they can play a crucial role in addressing such social and ecological challenges (Ersoy & Yeoman, 2020). Yet these challenges require not only urban design solutions, but also the re-thinking of the processes to design, implement, and operate them (Colloff et al., 2017; Saad-Sulonen, Eriksson, Halskov, Karasti, & Vines, 2018). Nevertheless, public space institutional systems are complex and involve actors from multiple backgrounds and sectors, often with diverging aims and knowledge (Webb et al., 2018). Process-oriented approaches to design need to take into account such diversity of knowledge, values and aims (Baibarac & Petrescu, 2019; Colloff et al., 2017).

Co-design has been defined as the collaboration of multiple actors in the design process aiming to improve the outcomes (Manzini, 2015; Mattelmäki & Visser, 2011; Sanders & Stappers, 2008). Co-design can then play a crucial role to deliver context-specific and locally suitable urban projects that can also be flexible to change and transform (Smaniotto Costa, Mačiulienė, Menezes, & Goličnik Marušić, 2020). We understand urban co-design as a process in which strategic, technical and socio-cultural actors from various backgrounds and sectors collaborate in multiple levels throughout the phases in which the projects are designed and detailed, to achieve more feasible, context-specific, legitimate, and ultimately, resilient projects.

Authors often emphasize the benefits of co-design as a way to achieve knowledge co-producing and social learning (Berkes, 2009; Collins & Ison, 2009b; Enserink, Monnikhof, & Enserink, 2003). In the urban context, such processes facilitate the integration of socio-ecological knowledge, values and aims into the design. This may improve the feasibility, context-suitability and legitimacy of urban projects by

fostering collaboration throughout strategic, technical and socio-cultural arenas (Gaete Cruz, Ersoy, Czischke, & van Bueren, 2022b). However, most studies on co-design focus on the legitimate and empowering outcomes of such processes through the use of diverse tools and methods (Saad-Sulonen et al., 2018; Sanders & Stappers, 2014). There is still a need of clarifying how knowledge, values and aims are provided, analyzed and integrated in such processes by the interactions amongst the involved actors (Webb, Elmqvist, et al., 2017). The question remains, how does urban co-design contribute to socio-ecological knowledge co-production? And in doing so, how such socio-ecological knowledge contributes to the context-specificity of the designed public spaces? Furthermore, it is relevant to understand how this occurs in the long-term throughout urban development projects.

2. Research Development

The need to rethink our cities require new solutions, but also new processes to develop such solutions. There is the need to better combine the existing local knowledge and values if we aim for context-specific public spaces. The study explores how an urban co-design approach may contribute to the integration of the socio-ecological knowledge of public spaces. Furthermore, we aim to clarify how the socio-ecological knowledge, values and aims provided by the involved actors are analyzed and integrated throughout the design processes of public spaces. We start from the conceptualization of public space to capture the contents and themes that are integrated in co-design processes.

We propose the Urban Socio-Ecological Co-Design framework (USEC) to expand the Urban Co-Design Framework previously developed by the authors (Gaete Cruz, Ersoy, Czischke, & van Bueren, 2022a). We acknowledge the need to conceptualize and integrate the contents, knowledge, values and consequently the components of public space co-design. We adhere to the socio-ecological systems approach aiming to capture and conceptualize the contents of public spaces design endeavors. To do so, we conceptualize them as systems that unfold physically, dynamically and institutionally. In the next sections we explain the construction of the conceptual framework and how we used it to analyze the cases from practice.

2.1. Public spaces from a socio-ecological systems approach

The urban challenges that cities face require that we re-think our solutions and consequentially the ways in which we design them. Many nature-based and ecology approaches have been said to provide solutions for climate adaptation towards sustainable transformation and development (Nesshöver et al., 2017). Such approaches acknowledge the evolving nature of urban systems, and their scales and interdependencies (Berkes, 2017). In a systems approach, we understand public spaces as socio-ecological systems that unfold spatially, dynamically and institutionally in multiple timeframes and scales.

Tab I. Brief definition of the socio-ecological themes of public space systems

Themes	Brief definition
Social	Human, social and cultural physical and dynamic components.
Ecological	Non-human, ecological and natural physical and dynamic components.
Socio-ecological	Physical and dynamic components that play both human and natural integrated roles.

Collaborative approaches to urban design require complex system-thinking to conceptualize public space (Webb, Tapper, et al., 2017). In such processes, the shared understandings and ideation require agreed and relevant guiding themes (Van Dooren, Boshuizen, Van Merriënboer, Asselbergs, & Van Dorst, 2014). We adhere to the socio-ecological systems approach to cities to understand human and non-human as intertwined and interdependent, in ingoing processes of change, and the need to deal with such complexities (Landman, 2021). Such interdisciplinary approach must integrate the physical, spatial, temporal patterns (Frank, 2017). We conceptualize public spaces as socio-ecological systems highlighting their main guiding themes (Van Dooren et al., 2014).

Cities have long been understood to unfold spatially and functionally, and have often been visually conceptualized through layered approaches and trajectories (Jeroen van Schaick & Klaasen, 2011). Yet

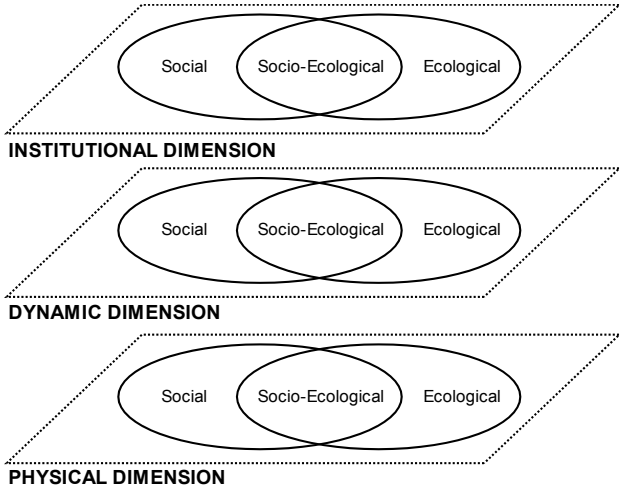

Fig 1. Public spaces as socio-ecological systems that unfold in physical, dynamic and institutional dimensions (Credits, Gaete Cruz, M).

such approaches sometimes fail to conceptualize the temporal, evolving and social complexity (J. van Schaick & Klaasen, 2007). In the recent decades there has been an expansion of systemic and ecological approaches that conceptualize cities as evolving processes acknowledging flows and functions that are both urban and natural (Van Bueren, van Bohemen, Itard, & Visscher, 2012).

Tab II. Three dimensions of urban socio-ecological systems.

Dimension	Definition
Physical	Spatial structures, elements, components, patterns.
Dynamic	Processes, functions, flows, resources.
Institutional	Actors, rules, knowledge, values, aims, and decision-making acts.

We understand public spaces as spaces where physical networks, elements and structures coexist in a complex systems approach (Berkes, 2017). Yet in such urban spaces, time plays a role in the evolving flows and functions that operate, and the activities, mobility and the ecological biodiversity (Webb, Tapper, et al., 2017). Public spaces physical and dynamic dimensions don't always match their institutional jurisdiction, so it becomes relevant to understand their interdependencies and influences (Bélanger, 2013). To do so, we conceptualize an additional urban dimension in which institutional settings interact towards design dialogue, ideation and decision-making. Such an approach defines the third dimension in which urban design takes place (Van Dooren et al., 2014), the institutional dimension that is relevant for the urban co-design of public spaces.

2.2. Co-design processes as collaborative cycles throughout long-term processes

We acknowledge urban co-design as a process in which design acts occur throughout the design phases in different collaborative levels (Gaete Cruz et al., 2022a). Such an approach links a cyclical, a collaborative and a process-oriented approach to co-design, and are further explained in this section.
We adhere to the cyclical conceptualizations of design (Cross & Roozenburg, 1992; Hansen et al., 2019; Jonas, 2007; Roozenburg & Eekels, 1995) that define four repeated design acts: research, analysis, projection and selection. In such processes, the design acts capture how the knowledge and values

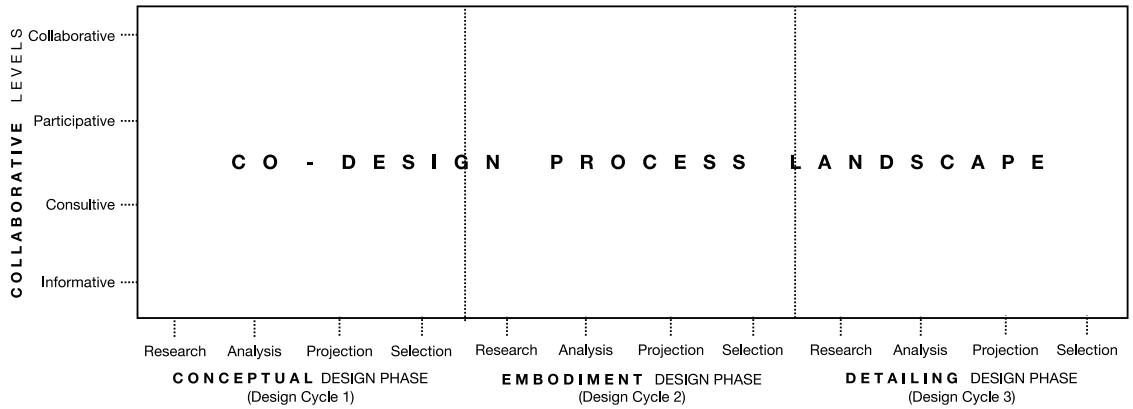

Fig 2. The Urban Co-design Process framework: collaborative levels on the Y-axis and design steps and phases on the X-axis. (Credits, Gaete Cruz et al., 2022a).

from the diverse involved actors are collected, prioritized, integrated, and further created. This may result in more integrated components of public spaces and better-informed urban designs.
In co-design processes, such design steps are often participative amongst the involved actors. In complex institutional settings, were actors come from diverse sectors and backgrounds, this requires diverse collaborative approaches. We adhere to the ladder of participation (Arnstein, 1969) but re-interpret it to better suit the diverse collaborative endeavors from practice (Gaete Cruz et al., 2022b). This follows the recent shift of co-design and participatory design literature aiming for more horizontal and balanced power dynamics amongst the actors towards social learning (Collins & Ison, 2009a; Lee, 2008; Manzini, 2015; Mattelmäki & Visser, 2011). By doing so, the design cycles result in the open provision of knowledge and values, the shared understandings, analysis, and synthesis of design strategies, and the consequent collective ideation and generation of design outcomes.

We expanded the co-design framework into the design phases of the process. Design theory conceptualizes three main phases in such processes: conceptual, embodiment and detailing (Cross & Roozenburg, 1992; Roozenburg & Eekels, 1995). This captures how design cycles are repeated in the long-term as the project is further developed and detailed. If the projects are collaboratively addressed, then the framework allows a diversity of co-design moments to be identified and further analyzed (Gaete Cruz et al., 2022a).

2.3. Methodological approach and cases

We take a case study approach based on data retrieved in fieldwork undertaken in 2019-2020. Primary data was obtained through twenty-five semi-structured interviews with actors from diverse backgrounds and sectors of the two processes. Such experiential and qualitative data was then complemented with secondary data from reports, online platforms, and digital news media.
We study two cases of recent urban park co-design processes in the Atacama Desert. One of them, in the river basin of Copiapó River, was led by the public sector and developed by private interdisciplinary urban planning and design consultants fostering citizen participatory initiatives in Copiapó city in the Atacama Region of Chile. The second case is a seaside urban park led by Creo Antofagasta NGO (a public-private-citizen partnership) and developed by an urban consultant consortium (management, urban design and engineering) in Antofagasta City. In both cases, the projects aim to address socio-ecological local challenges and the leading actors fostered multiple forms of collaborative dialogues integrating formal and informal knowledge, values and aims throughout long-term co-design processes.

2.4. Results and discussion: The two co-design processes from a socio-ecological systems approach

The framework was used to classify, map and analyze the diversity of knowledge, values and aims reported by the interviewees to have been relevant within the two co-design processes. First, the results are organized according to the socio-ecological themes. Then, they are classified in terms of their spatial, dynamic or institutional implications. Finally, they were linked to the design cycle activities during the phases of the process. This allowed the identification of two coexisting learning arenas in which knowledge, values and aims flow from the institutional system to the socio-ecological designed projects. Findings suggest that a co-design approach to the socio-ecological functional and spatial components of public spaces may improve their context-specificity and suitability. In linking the actors, their knowledge backgrounds and contributions to the process (reported by the interviewees), with the moments in which this happened, this study addresses co-design as a long-lasting knowledge co-production and learning process. In doing so, it overcomes the short-term understandings of co-design and acknowledges how the diverse actors collaborate in design steps. Acknowledging the flow of contents highlights that the integration of diverse socio-ecological knowledge and aims throughout co-design processes may foster and make possible the public space resilient transformations that are needed.

3. Findings and Conclusions

This study develops the socio-ecological co-design framework that may be useful to conduct co-design processes in practice, as well as to plan them. A layered conceptualization of public spaces may play a role in facilitating the identification of actors, activities and knowledge, as well as a communicative tool for strategic dialogue, collaboration, and negotiation (Jeroen van Schaick & Klaasen, 2011).

This study allow the authors to contribute to a new definition of urban co-design as a process in which strategic, technical and socio-cultural actors from various backgrounds and sectors collaborate in contributing, analyzing and projecting urban design, not only more feasible, context-specific, legitimate, and resilient projects are to be achieved, but that institutional settings benefit from social learning (Huybrechts, Benesch, & Geib, 2017) processes that continue after the design processes have long ended. In doing so, co-design may foster further forms of co-implementation, co-operation, and co-activation processes that may change the future of public spaces and prepare them for further socio-ecological paradigm changes. Such preparation capacity of socio-ecological systems is said to improve their evolutionary resilience (Davoudi, Zaucha, & Brooks, 2016).

More studies are needed to understand how knowledge and values flow in urban co-design processes. For instance, the interdisciplinary interactions could be further studied. On the other hand, the framework we developed, may be used to study other public space co-design processes in practice. It may also be used to plan further urban co-design processes. Further research could focus on how urban co-design contributes to collaborative interactions in the implementation and operation phases that follow design. We know it does contribute to legitimizing the processes, informing the projects, and improving the appropriateness of the designed spaces (Gaete Cruz, Ersoy, Czischke, & van Bueren, 2021; Gaete Cruz et al., 2022b).

Although framed in Latin America; the framework and findings may be useful elsewhere.

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Spas, new possible scenarios for human and city's well-being.

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Abstract

Spas today represent an important opportunity for human well-being and the development of the territory. Today spas are to be valued not only for their already renowned health properties but also and above all for their different landscape characteristics. The pandemic experience made us rediscover the value of nature and the importance of preserving it. Thanks to the intertwining of nature, science, and art, it is possible to approach a multi-disciplinary design, aimed at recalibrating strategies and objectives and aimed more and more connections with other sectors (tourism) and with the needs and opportunities of the new generations.

Keywords

Spas, design, territory, wellbeing, nature

1. Introduction

Spas - as part of the "associative cultural landscape", that historically, the natural element has been connected to socio-cultural and artistic practices - represent an important resource for the entire Peninsula. Today, after a covid-19 pandemic where psycho-physical stress has risen to the highest levels worldwide, spas must no longer represent *locus solus* linked only to medical therapies but must be part of a system where human well-being is integrated with the design of the territory, where sustainability comes first.

2. Article

At the beginning of the year 2020, the whole of humanity has seen its habits change abruptly from one day to the other. Due to social distancing, the obligation to stay at home, and the fear of being infected, people have experienced and are experiencing unusual stress that has affected and will affect both physical and especially psychological well-being. This is all because of the COVID-19 pandemic that has shocked first of all countries in the world, China.

The pandemic experience so far, unlike any other that has happened in history, has resulted in different factors for stress protection - at least from what we know from current stress and well-being theory (Evans et al., 1987; Parkes, 1994; Ross and Mirowsky, 2002; Kammeyer-Mueller et al., 2009).

However, the pandemic experience is atypical of other types of stress (work stress, family stress, and life event stress). Higher resilience scores are associated with fewer concerns about COVID-19 (Barzilay et al., 2020). In a study of 1,086 participants from the United States, the most reported strategies for managing stress were a distraction from media and seeking social-emotional support (Park et al., 2020). However, further empirical studies in this area are necessary to explore what other factors protect people from pandemic stress. Furthermore, as studies suggest that individuals' effects and well-being fluctuate from time to time (Kuppens et al., 2010; Sun et al., 2020), researchers are calling for more intensive

longitudinal measurements to account for time (Kozlowski, 2015). However, it has been suggested that empirical studies should measure time-sensitive variables from text messages, diaries, and even blogs and vlogs, which would help capture the time-sensitive psychological construct (Hill et al., 2013).

The big data method is an intensive, discrete longitudinal measurement ideal for understanding the effect of a global disaster event (e.g., a pandemic) on people's well-being and is useful for obtaining a national, diverse sample. But, the purpose of this contribution is to highlight the importance of integrated design for community well-being. Design with at the base a sustainable approach made of resilience practices thanks also to new approaches between communities and territories, depending on the peculiarities that characterize them.

Specifically, the city characterized by natural landscapes represents today, the *locus amoenus* capable of restoring human physical and mental homeostasis. Today, what leads back to the practice of wellness in a broad sense is undoubtedly thermalism, as it should be understood today. In other words, at the basis of contemporary thermalism is the modern vision of nature as a resource: a resource to be explored, analyzed, and used intelligently, bringing together all forms of knowledge. Since the second half of the eighteenth century, waters, muds, and caves have been examined to explore their potential and perfect their exploitation for therapeutic purposes: an unexplored field in which geography, geology, mineralogy, volcanology, and chemistry meet in a dense and unstoppable advancement of scientific knowledge, which finds its final application in medicine. Chemists, physicians, but also scholars of homeland history during the nineteenth century wrote and published a large number of pamphlets, articles, and guides to give an account of the conditions of the springs, to trace their history and spread their knowledge, to testify the curative efficacy with lists of detailed clinical observations.

The elements enter the common language: sulfur, salt, iodine... a very rich production, a legacy of skills and passions, an inescapable reference point for today's spa culture and practice, which have given back centrality to natural components. In the liberal age, in the reinterpretation of the spa, citations of classical myths were interwoven with more modern ones of the nation and the homeland. The natural resource soon became an economic resource: the bottling and distribution of mineral water for therapeutic purposes gave life in all Western countries to large industrial and commercial enterprises in the early nineteenth century. In Italy, too, the market was highly competitive and any innovation or cultural change was promptly seized upon, such as, for example, policies to protect motherhood and childhood. This historical premise outlines how today the spa landscape becomes the container of the fundamental values of the New European Bauhaus through a combination of global and local dimensions, active participation of the community belonging to the territory of reference, and transdisciplinarity (an interweaving of philosophy, medicine, psychology, and design). Hence the need for a reflection focused on long-term planning that integrates the active participation and shared between institutions and the various professionals in the fields of science, arts, and technology to arrive at possible scenarios that put in the system a new way of living with nature and for nature, for the welfare of the entire ecosystem, including human beings.

Fig 1. Two schemes and two concepts to show the macro-difference between well-being and stress.

Fig 2. A conceptual scheme to show the importance of health with a strategic vision.

3. Conclusion

The purpose is to contribute to the well-being of humans through strategic design for territory, enhancing the value of spas. The main objective is to study and implement strategic actions such as wayfinding design and the storytelling of the territory, where there are natural attractions and thermal waters. Now more than ever, it is necessary to build a new image of spas, which must be known and positioned in a privileged way in the territorial system as a fundamental and very important part of counteracting the effects of stress, since thermal waters raise the level of endorphins, the hormones responsible for the feeling of well-being and relaxation. The study of the psychological conditions of people in urban centers and the analysis of the peculiarities of the territory and its services is the basis of the research, which is still in its embryonic stage. A multidisciplinary study that includes neuro-architecture, psychology, anthropology, and sociology may be useful to reach new possibilities for spas, protagonists of human psychophysical wellbeing in all seasons, and of safeguard of the territory. Spas are no longer places for their own sake and therapeutic purposes only, but they can and must be part of an eco-sustainable system that reconnects human with human, human with nature, and human with the territory. As any progress and territorial development must be designed taking into account the relationships and interconnections between grey architecture (building), green architecture (nature) and blue architecture (services).

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11 Beautiful, sustainable, and inclusive places: the role of appraisal and evaluation

Nomad Management of Urban Development: the complex value of temporary communities

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Abstract

The research "NOMAD - Nomad MAnagement of Urban Development" intends to explore the effects of temporary uses and the role of temporary communities in urban regeneration. Temporary uses can produce intangible values and also changes the surrounding housing market. Although temporary communities make spontaneously sustainable practices and generate urban values, yet the values produced by temporary uses seem to be little evident. The research aims to identify and enhance the processes of community-oriented temporary uses, in order to estimate the impacts of such experiences and better manage empty available spaces for temporary urban communities. The paper presents the NOMAD research methodology.

Keywords

Temporary uses, adaptive reuse, complex value, multi-criteria evaluation, decision aiding

1. Introduction

Nowadays, there is a lack of affordable space for housing and workplaces, while cities have many vacant spaces, representing a significant potential for new activities. In Europe, more than 38 million dwellings were unoccupied (permanent or seasonal, or secondary residences). The temporary communities are urban nomads, voluntarily or not.
They temporary inhabit spaces for a short time span, usually for low rents, and generate value through active use and management, but eventually have to move if higher rents can be achieved or the space will be redeveloped [fig.1].
Nomadic communities are composed of diverse social categories: young and adults, students, workers, immigrants and homeless. This research proposal is focused on spaces in buildings that have lost their original use, e.g. in the case of vacant office buildings (Remøy & Street, 2018), houses disposed from housing association portfolios, or buildings in retail areas that lack a financially feasible business model for commercial parties.
For these buildings and areas, what happens in the meantime (months or years), waiting for new permanent functions, can have a strong impact on urban dynamics. In virtuous cases, nomadic communities generate vibrant neighbourhoods, attracting new activity, improving street safety, generating intangible urban values, and boosting real estate markets, eventually leading to gentrification. As a consequence of increased real estate values and gentrification, the temporary users who co-produced the increased values, have to move again and start again in often precarious conditions. This is the paradox that this research will focus on.

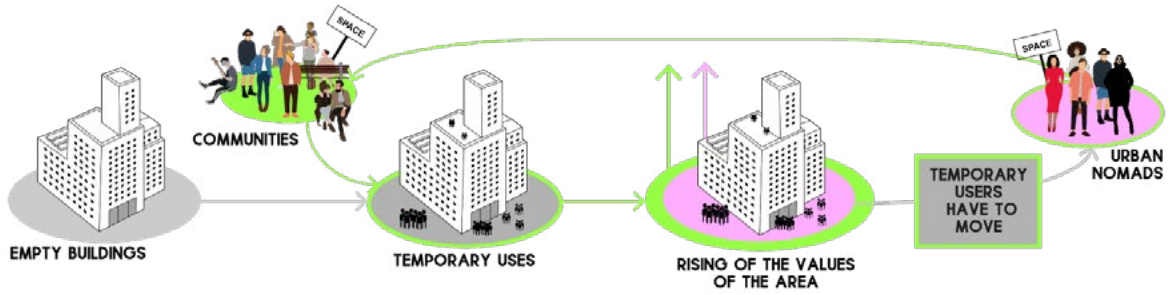

Fig 1. Exclusion process of temporary communities (Authors, 2021)

2. Research Objectives

Actions like reducing the waste of unused space and enhancing the co-creation capacity of nomadic communities are promoted by European policies (EC, 2019) and the New European Bauhaus movement (Bason et al., 2020), which are shifting entire systems towards inclusive growth, public purpose and richer, more diverse forms of value development, evaluation, and value capturing. Furthermore, European circular cities (Williams, 2021) are moving toward zero-waste models, that aims to optimise the use of environmental, social and economic resources available, including real estate and human resources. In this European context, although nomadic communities develop sustainable practices and generate circular urban values, values that they co-create are not evident in real estate evaluation practices and are not captured in urban regeneration. In this research context, this paper leads to the following research questions:

- Which values do urban nomads co-produce for vacant buildings and their neighbourhoods?
- Who benefits from the added values?
- How can the tangible and intangible values be quantified and distributed in a circular framework?

To estimate the impacts, qualitative and quantitative data study cases will be spatialised in multimedia maps. Based on this, multi-criteria and multi-group evaluations will be applied to analyse the tangible and intangible value of nomadic communities for urban redevelopment, for the co-design of a catalogue of temporary uses and a business model.

3. NOMAD Methodology

NOMAD applies research methods like statistical analyses, Geographical Information System (GIS) mapping and case studies analysis, innovating in the collection of subjective and objective data and in combining the different data sources and research methods.
First step of the research will be the case study data collection. The data collection will be spatialized in multimedia mapping, combining narratives and statistics. The qualitative and quantitative data collection will be conducted through document analysis, in-depth interviews, semi-structured interviews, questionnaires, videos, and audio recordings in the field visits. Archive multimedia data will be gathered according to the availability of the case studies.
The narrative data from the ongoing case studies will be collected from the field visits through interviews, questionnaires, texts, audio and videos. Quantitative data about real estate values and socio-economic data correspond to a time span that include the temporary use will be gathered and analysed. Eventually, qualitative and quantitative data will be spatialised in a multimedia cartography using the open source software QGIS.
This task includes the collection of real estate market values, building and location characteristics, socio-cultural values, and multimedia information (Sandercock & Attili, 2010).
The participant observation method (Musante & DeWalt, 2010) will be applied to collect information through interviews and multimedia qualitative date in the ongoing cases. Information of past cases will include interviews, case documents and archive data. The data will be included in GIS maps to realise

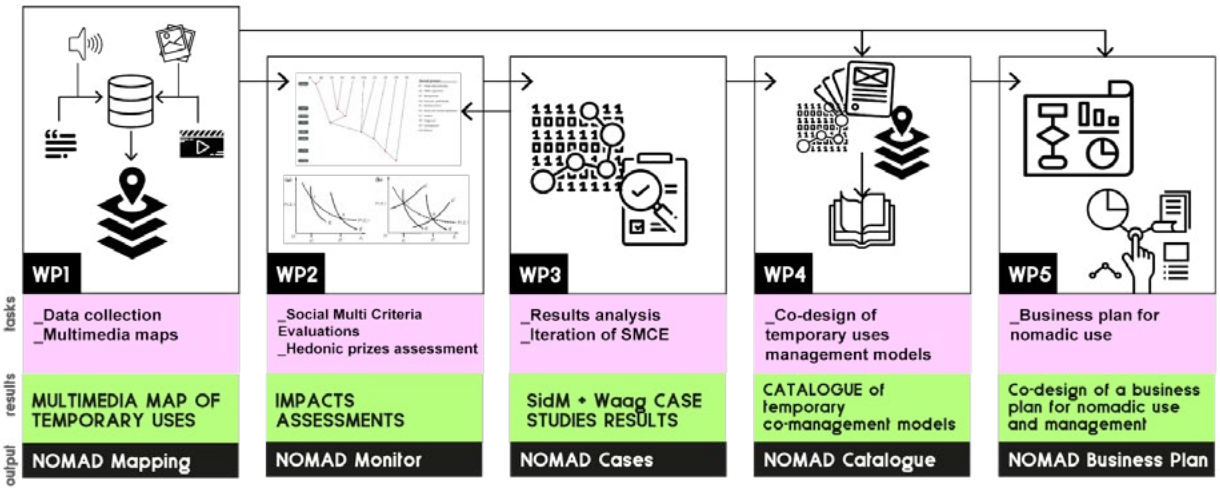

Fig 2. Methodology and work packages (Authors, 2021)

a multimedia cartography (Cartwright & Peterson, 1999), combining narratives and spatial analysis in a time span starting at the initiation of the projects until temporary use is eventually ended. The NOMAD multimedia mapping of temporary uses, realised in GIS, innovates through statistical and narrative data collection. The analysis and incremental evaluations (Cerreta et al., 2020) of the data mapped will combine different methods for: (1) real estate assessment, and (2) Social-Multiple Criteria Evaluations (SMCE) (Munda, 2008; Fusco-Girard et al., 2006), including tools for hybrid collaborative decision-making processes (Cerreta et al., 2018) integrating the method Novel Approach to Imprecise Assessment and Decision Environments (NAIADE) (Munda, 2006) and its recent evolution SOCRATES, a web-based SMCE software tool. The work is structured in five work packages [fig. 2].
The complex value of temporary communities will be clarified and operationalised through the project. It will be assessed through qualitative and quantitative assessments of the impacts on the surroundings of the case studies, using hedonic price models to understand tangible financial value development, and case study methods (including interviews, case documentation, journal and newspaper articles) to evaluate intangible social and cultural value development.
The co-design of models for nomadic use and co-management results from the analysis and work with the non-academic partners, who will apply the results in their further research and practice in the field.

3. Expected results and conclusions

The NOMAD project is expected to produce social and cultural impacts through its methodology, output and outcome, in the improvement of temporary reuse knowledge and community empowerment.
1. The NOMAD map. The multimedia cartography will be a knowledge tool for nomadic communities and stakeholders involved in the practice of temporary use. The map and mapping tool will work also after the project, and can be further implemented in other countries with local data.
2. The NOMAD monitor will use the evaluation framework to ex ante assess the values of future temporary reuse projects and monitoring the dynamic changes and the opportunity of partnerships and coalitions. Public bodies, private owners, stakeholders and scholars will apply it to plan future collective projects.
3. The NOMAD case studies. The experiences studied and analysed are lessons and examples for stakeholders and interested parties and will support decision making in the first phases. From the case studies' best practices' and decision making factors and indicators will be distilled, which will serve as input for the projects of the research partners.
4. The NOMAD catalogue. Is an easy reference tool for decision making in business plans. It will offer opportunities to stakeholders to co-design a management plan and business model for temporary uses. The catalogue will facilitate users and decision-makers, i.e. public and private owners of vacant or disused real estate, to define temporary co-management strategies with those urban collectives and

The catalogue will facilitate users and decision-makers, i.e. public and private owners of vacant or disused real estate, to define temporary co-management strategies with those urban collectives and nomadic communities that today operate outside the schemes of the real estate market.
5. The NOMAD business plan. Based on the initial outputs, a business plan for feasible implementation of nomadic use and management.
The complex value of temporary communities, their impacts, related temporary space management systems and business plans will form a decision support system for public administrations and individuals to improve the re-use of the city according to flexible needs and changing communities.

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The value of change: towards social impact assessment in Scampia

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Abstract

The Municipality VIII of the Metropolitan City of Naples, consisting of the neighbourhoods of Chiaiano, Marianella, Piscinola and Scampia, has already been the subject of university study for several years in the context of the Third Cultural and Social Mission. Located in the northern suburbs, even if it is one of the most unresolved municipalities of Naples, with significant economic and social unease, for some years now - and in spite of Gomorra - it has been transformed into a fertile field of social innovation. An initial assessment of the impacts of the social enterprise activities that have been set up and are effectively contributing to 'change', as in the regeneration of community structures, is therefore being drawn up.

Keywords

Suburbs, urban regeneration, social impact, change, assessment.

1. Context and change

Municipality VIII, the northern gateway to Naples, the centre of the Metropolitan City, is a varied and creative area where the "Third Sector" is contributing to 'change' through urban regeneration and the recovery of degraded spaces and buildings (buildings which, for example, become the Associations' headquarters). This Municipality is made up of four neighbourhoods: Chiaiano, Marianella, Piscinola and Scampia, all characterized. *Chiaiano* has a rural territory that constitutes a large part of the Parco Metropolitano delle Colline di Napoli, a flywheel for the future development of the City. There, within Beni Confiscati ex L. 575/65, is the 136,840 m2 rustic fund, which falls within the area of the Parco assigned in 2007 to the non-profit association fighting illegality and camorristic culture (R)esistenza. It is currently used as a public park with the possibility of creating an "educational farm for minors" and "social gardens", in line with the objectives set by the Park Authority in the Masserie di Chiaiano area. *Marianella*, developed around the Casa Natia di Sant'Alfonso Maria de' Liguori, which is still the source of "popular" initiatives of urban regeneration through a concept of graphic evocation and value of "beauty", the subject of critical reflection, so much so that Marianella is associated with the image of "Horizontal Cathedral" (Cirillo, Lauda, & Todisco, 2020). *Piscinola* preserves the largest Multipurpose Centre in the entire Metropolitan City, designed by Gerardo Mazziotti in the 1970s/80s and now abandoned, with the exception of a few rooms inside it entrusted to a number of local Associations. *Scampia* is the subject of the urban regeneration project Restart Scampia in the Vele lot, which the current Administration intends to complete through the PNRR. Further, in all this neighbourhoods, where Linea1 of the Metro is at the heart of the Piano Comunale dei Trasporti di Napoli, the Stations (which are much more neglected than the better-known Stations of Art in the city centre) are currently the subject of spontaneous interventions of urban creativity, coming from below and only sponsored by the local Public Administration (Zerlenga, Forte, & Lauda, 2018). These are the two Stations of Chiaiano-Marianella and Piscinola-Scampia, which, thanks to the intervention of Third Sector Associations such as Let's Think and Gridas, have been enhanced by works of Street Art [fig. 1]. Along with these administrative interventions in favour of urban regeneration, several other actions and initiatives are carried out by the Third Sector. In relation to the activities of "Third Cultural and Social Mission", the

Fig. 1. “Un Ponte Oltre i Muri” – II Edizione. Linea1 Piscinola-Scampia bridge and station turned into a work of art with "RigenerAzione”. Image published in *2A news.it* in the article written by editorial staff: *La stazione della metro di Scampia trasformati in opera d’arte* (https://www.2anews.it/la-stazione-della-metro-scampia-trasformati-opera-darte/, 12 July 2017)

Dipartimento di Architettura e Disegno Industriale Università degli Studi della Campania "Luigi Vanvitelli” signed, in 2017, a Memorandum of Understanding with this Municipality to develop "didactic-training and research activities in the field of architecture and design for the promotion of themes of material and immaterial environmental protection as well as urban regeneration in the perspective of social innovation". In this perspective was chosen to elaborate the Social Impact Assessment (SIA) in support of a Public Administration, the Municipality VIII, which, in the context of procedures for entrusting services of general interest, is required to provide for "the implementation of social impact assessment systems by Third Sector Bodies that have relations with the same Public Administration, so as to allow for an assessment of the results in terms of the quality and effectiveness of the services and activities carried out" (Decreto 23 luglio 2019, Linee guida per la realizzazione di sistemi di valutazione dell'impatto sociale delle attività svolte dagli Enti del Terzo Settore). To this end and with specific reference to Scampia neigboroud - object of evaluation in the current state of research- a number of social activities related to the urban regeneration have been identified.

2. Towards social impact assessment in Scampia

It is well known how the concept of “social impact” has received increasing attention in recent years, in particular after the Third Sector Reform Law which defines SIA as "the qualitative and quantitative assessment, over the short, medium and long term, of the effects of the activities carried out on the community of reference with respect to the identified objective" (Law 106/2016). It therefore aims to measure the effectiveness of the company's work, not from an economic point of view but in terms of the change produced in the territories and communities of reference. In the Scampia neigboroud he Pangea Project, entitled “Il giardino dei cinque continenti e della nonviolenza”, intends to promote a

Fig. 2. “Pangea”, the area before urban regeneration. Image published for crowdfunding on *produzionidalbasso* website (https://www.produzionidalbasso.com/project/progetto-pangea-scampia/, 2016)

citizens and artists from the area have been involved in its implementation. As part of this large-scale project, in addition to the care of 6 flowerbeds (representing the 5 Continents + the Mediterranean), there is also a large-scale mural: 130 metres long and 3 metres high, which extends along the wall of the “Antonio Landieri” Stadium. The mural consists of eleven scenes, each depicting a well-known character symbol of nonviolence (Cicala, & Lauda, 2021). Also in Scampia, adjacent to the area affected by the Pangea Project, there is the Arci-Uisp Scampia Project which of particular interest, promoted by the Fondazione Cannavaro-Ferrara, the regeneration of the Parco Corto Maltese promoted by the Pollici Verdi Association and the “unveiling” (a word coined by Mirella La Magna, wife of the artist, who rejects the term "restoration") of the 200-metre-long mural entitled "La cultura, una storia infinita" created by Felice Pignataro in Via Fratelli Cervi on behalf of the 45th School District in 1985 on the boundary wall of the old Virgilio III prefabricated middle school, which is now one of the ASIA offices. The mural restores to the neighbourhood both the cultural content of the work itself as well as the history of the Fratelli Cervi who named the street [fig. 3]. Finally, there is the creation of the Ecomuseo Urbano diffuso di Scampia: many activities and a digital archive to connect places and generations, the first in the city of Naples, promoted by the Chi Rom e... Chi No Association, selected under the call for proposals "I quartieri dell’Innovazione" of the Assessorato alle Politiche Giovanili e al Lavoro del Comune di Napoli. The project was co-financed by the European Union, European Social Fund, as part of the Programma Operativo Città Metropolitane 2014-2020.

It was therefore chosen to start the SIA for a specific activity, the Pangea Project, considering, in accordance with Venturi (2017) all the principles that characterize it: “relevance”, “reliability”, “comparability”, “transparency and communication”. The purpose of the project is of general interest and affects the community dimension; it in fact promotes a training course in nonviolence, together with the recovery and redevelopment of an abandoned area.

From a methodological point of view, according to AICCON, the evaluation process should be divided into 5 phases: 1. stakeholder engagement; 2.activity analysis; 3.impact measurement; 4.evaluation; 5.communication.

At present, in a context where no social impact assessment has been launched, it is only possible to outline the essential steps that structure the evaluation process that will be carried out for the above-mentioned initiative, the Pangea Project:

-phase 1: identification of stakeholders, of the beneficiaries (direct and indirect) of the activities of general interest produced by the actions (the identification of financiers, donors, recipients of the interventions, workers, volunteers, citizens, local authorities is in progress);

-phase 2: identification of the dimensions of value that the activities have produced (social, economic, environmental, cultural values);

-phase 3: impact indicators (still a particularly critical aspect, also given the lack of available data).

Fig. 3. "Unveiling" of the work by Felice Pignataro in Via Fratelli Cervi. Image published in *DIMMIdiSCAMPIA racconti di quartiere* in the article: *Dopo 35 anni si "disvela" l'opera di Felice* (https://dimmidiscampia.wordpress.com/2020/08/18/dopo-35-anni-si-disvela-lopera-di-felice/, 18 August 2020)

Consistent with ministerial indications (DL 19 Luglio 2019), the evaluation process, in this first step of the research, will attempt to "measure" the value of the change generated in Scampia neighbourhood thanks to the Pangea project. We are speaking about an ex post evaluation. An *ex post evaluation* will therefore be carried out.
The initial phase concerns the stakeholders identification: the involvement of stakeholders in the evaluation process is crucial to define the space of the analysis and the goals of evaluation that need to be measured. Three main steps will be followed: 1.mapping; 2.ordering; 3. involvement. A first structured stakeholders mapping, highlighting, for each one of the stakeholders groups, interest, attitude, change and grade of priority, is showed in table I.

3. Next Steps

Starting from this identification of the stakeholders of the Pangea Project, the direct involvement of them (appropriately programmed by means focus groups and interviews, etc.) will lead to a more detailed analysis of the context and to define the shared impact measurement goals. In accordance to the 'theory of change' and the logical framework of the impact value chain (Zamagni, Venturi, & Rago, 2015), will be possible to understand how the change was generated. This means to proceed with: 'inputs' classification (all the capital and human resources employed in the project); identification of 'activities' (actions implemented for goals achievements, as example in terms of creation of community spaces, training courses, etc.); 'output' (direct products and services from the activity, as example street artists involved, cultural initiatives, etc.); 'outcomes' (changes in the social situation of the target population resulting from the activity, changes in attitudes, behaviours or conditions); 'impacts': the social, economic, cultural, environmental consequences attributable to the activities (referred to long term changes). In this process, for the measurement of the impact will be necessary to select the most appropriate indicators and indexes (monetary and not-monetary, tangible and intangible, etc.), strictly dependent on the availability and quality of any data sources. Only then will it be possible to attribute a value, a meaning, to the results achieved by the measurement process.

Tab. I. Stakeholder identification, mapping and sorting *Pangea Project - Scampia*

Stakeholders groups	Interest	Attitude	Change	Grade of priority
Scampia Community	Beneficiary	Support	Positive	High
Municipality of Naples	Patron/beneficiary of the project result	Support	Positive	High
Methodist and Waldensian Churches	Lender/beneficiary of the project result	Support	Positive	High
25 crowfunding supporters	Lender/beneficiary of the project result	Support	Positive	Medium
6 Non-profit Associations	Main Partner/ beneficiary of the project result	Support	Positive	High
5 Schools	Main Partner/ beneficiary of the project result	Support	Positive	High
5 Street Artist	Partner/beneficiary of the project result	Support	Positive	Medium-High

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Pays Aimables: visual storytelling and landscape values

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Abstract

Mass tourism in Italy may leave aside spaces in a crisis of identity. Generally, these spaces belong to the inland areas, abandoned by the inhabitants over the years, even if bearers of values related to landscape care and culture. This heritage needs to be reinterpreted by activating resources and sharing knowledge through innovative actions and communication strategies. Promoting these articulated landscapes may suggest alternatives and allow travelers to rediscover the pleasure of immersive experiences and close relationships with producers and local actors able to witness their values. The paper illustrates an integrated research to explore this dimension with the aim of co-producing with local stakeholders a strategic vision to create operational plans to enhance less known territories. The process displays the design of a structured format developed through cartographic and landscape surveys, netnography, social analysis and collection of testimonials, to realize an interactive open-source travel e-book, QRcode linked.

Keywords

Beauty of the Landscapes, Storytelling, Social Value, Territorial identities, Local Testimonials

1. Introduction

Touristic trends, strongly influenced by the pandemic period, are changing fast with a clear orientation to rediscover less famous places. Sightseeing tourist destinations are growing, as they are able to offer responsible and sustainable experiences to travellers. The sustainability of the experience in terms of environmental impact and the potential to really get in touch with the local inhabitants, are essential conditions pursued by this form of tourism. Landscape with its values is the centre stage of these alternative and responsible experiences, which to be developed require increasing local communities' awareness of the value of their existing landscape heritage and, consequently, interest in its preservation and enhancement.

The appraisal of landscape beauty (Meyer, 2008) assumes an economic value because it connects, beyond historical and environmental significance, cultural assets - in the broadest sense of the term - and tourism. Heritage is seen as a driving force for the economy and not just as a legacy of the past: from preservation to valorisation. For this reason, the study of development models of landscape aesthetics has among its objectives an innovative development of local entrepreneurship related to the tourism chain.

The research, within the framework of a transnational cooperation of different partners, focuses on a case study about a part of Southern Piedmont, Western Liguria and Southern France (Pays Aimables Alcotra project). The multidisciplinary context engaged different expertises: landscape architects, product and communication designers, heritage experts, local actors and touristic agencies in order to identify innovative solutions for the promotion of the hinterland landscape. For the Ligurian study areas,

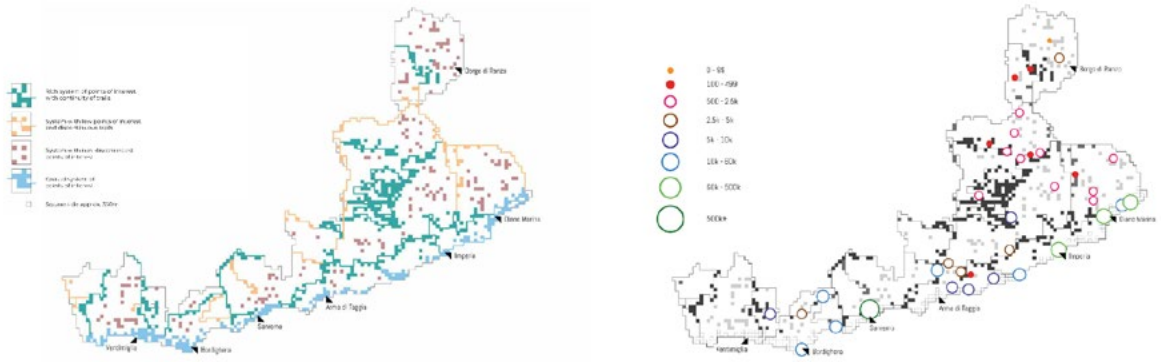

Fig 1. Maps: Analytical reading of systems of point elements and Number of posts per city-related hashtag on Instagram

three challenges were identified: to understand the qualities of constantly changing landscapes with specific identity values, expression of cultures, care, maintenance and traditions. Secondly, to involve local actors in the appraisal of the identity elements through a visual storytelling able to highlight the beauty and the diversity of these places. Finally, to promote the rediscovering of the pleasure of immersive experience, sensory stimulation and relationship with producers and local communities in alternative territories.

2. Methodology - Landscape: diversity and characters

The first phase of the research for promoting and enhancing the landscape heritage of the Ligurian inland areas began with the identification of the essential traits to define the different landscapes in the examined territory. An integrated reading of the ecosystemic, anthropic, cultural, social and economic aspects, at different spatial and time scales, revealed a territory which is characterized by an overexploited coast in contrast with a culturally and environmentally remarkable but abandoned rural hinterland.

Western Ligurian inner landscape showed a highly varied mosaic, rich in its attractive elements, both punctual [fig. 1] - panoramic viewpoints, perched villages, castles and other valuable architectural works, rural artifacts, villas and historical gardens, reception facilities and information points - and areal - terraced and forested landscapes, valuable agricultural systems, cultivation of flowers and ornamental foliage, olive groves and vineyards

The dynamic combination of territorial components and their mutual relations has enabled four types of landscape to be defined:

1 - Landscape at the French border, Ventimiglia - Bordighera: high coast, exotic vegetation, gardens of cultural richness, with a rural hinterland;

2 - Ventimiglia-Sanremo: strongly anthropized, it's characterized by a mosaic of different horticultural and floriculture crops;

3 - Olive groves behind Imperia: fascinating landscape where the olive tree is dominant, with terraces and historical villages;

4 - Arroscia middle Valley: a cross-country region between the valley and the mountains, with forests, olive groves and vineyards.

The result is a diversified territory, whose landscapes, although strongly characterized, are often poorly valued. The lack of a continuous network of routes linking the hinterland to the coast, has made it clear that a connection must be established. The research defined a so-called 'balcony road' [fig. 2], which will allow tourist flows to be linked to a new to discover hinterland and its values. This is a mixed-use

Fig 2. "Balcony road" to explore the diverse landscapes. Western Liguria.

road, which, crossing the main strategic places, aims to reactivate and regenerate a territory that is mainly abandoned, starting from its identity features.

Aiming to explore, understand and communicate the traits of this territory, it was essential to understand the qualities of the hinterland landscape as the expression of cultures and traditions resulting from the continuous work and maintenance of rural activities. The essence of a landscape is based on the special bond between human beings and their environment (European Landscape Convention, 2000): humans structurally shape a territory and draw out precise characters with semiotic contents; this territory, now bearing this significance, in turn defines the population that generated it, becoming a landscape (Villari, 2006).

Therefore, in order to comprehend the complex structure of the landscape as a whole, the research involved local actors in identifying and sharing the most relevant elements of landscape, to define a strategy to show the beauty and the typicality of each place.

3. Methodology - Design: perception and communicative strategies

Design as a discipline always puts humans at the center stage (Germak, 2008), so the territorial analysis needs to be accompanied by another one referring to the human component, particularly in these places, that can be defined more than others as a landscape built stone by stone by men (Salzano, 2006).

The integration of nature and history gives shape to various forms of landscape characterized by different origins, meanings, utilities and instances. Therefore, it is not easy to separate the identity of a place from that of its inhabitants.

The design research compared the landscape peculiarities with the social image (Parente & Sedini, 2019), created and shared by visitors, in their social media interaction, where a sequence of photos and videos overrides the written word. The direct dialogue with people is analyzed through netnography and then integrated with the testimonials' interviews.

This qualitative method is capable of studying social interactions in contemporary digital communicative contexts (Kozinets, 2020), through practices related to data collection, analysis, research ethics, and

Fig 3. Moodboard + mock ups

representation rooted in participant observation. The survey turned to two different directions: netnography to assess tourist flows through the images posted online by those who attend the places under study in relation to the quantity [fig. 1], but also, and above all, to the quality of the images to understand how landscape is perceived and what are the notable points of greatest attraction. In addition to the evident disproportion of posted selected images between the coast and the inland, an overall image of the inland areas also emerged, which allowed to build the basis for a visual storytelling of these landscapes that can engage travelers seeking experiences and promote visual and heritage enjoying (Panozzo, 2019). A dedicated tool, inviting people to rediscover the pleasure of an immersive experience, enriched by the contact with local testimonials, conveys the site-specific promotion. The travel e-book provides an itinerary and a sequence of panoramic viewpoints, from which to understand landscape, finding experiences or different sports trails. The travel book also gathers all the video interviews and the pictures collected during site visits, selecting various hotspots where the reader can browse online views of the amazing landscape, find interactive maps to explore itineraries, and get general information about local activities [fig. 3].

4. Conclusion

Starting from the highlighting of the most significant elements to describe the diversity of landscapes, the research aimed to point out actions (Magnaghi, 2000) to enhance them, as possible tourist products, able to convey culture and beauty to visitors. Combining landscape and design-driven surveys and techniques, the research team displayed and pioneered a format of an interactive open source travel e-book. The testing of this tool can be a contribution to build a strategy for a strong and deep-rooted landscape identity, promoting the fruition of natural and cultural heritage. Many Italian marginal-to-tourism landscapes need to reinforce their image to attract people, from visitors to operators. They are resilient territories, with high potentialities to be rediscovered. It is therefore interesting to prepare models and instruments to enhance traditional products through contemporary strategies, using new digital languages.

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Evaluation issues of cultural heritage impact-led regeneration processes. The case of Italian inner areas.

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Abstract

This article deals with new models of impact-led regeneration as encouraged by the policies and action programs of the European Union on social sustainability dimensions. In this context, authors focus on emerging evaluation issues within policy decisions addressed to inner areas impact-led regeneration processes based on local cultural heritage.
In particular, the article aims to introduce the Theory of Change concerning its application on a policy for inner areas, with a special focus on evaluation implications and the strengths and limits of the evaluation approach. The case study under analysis is the Fondazione Cariplo AttivAree Program for two Italian inner areas, Valtrompia and Val Sabbia, in the Lombardy Region.
This research is intended to provide a basis for future developments in evaluation models and tools to strengthen the operability of the Theory of Change, while promoting a combined use of qualitative (based on values and beliefs) and quantitative (based on evidence) data.

Keywords

Social sustainability, Theory of Change, Inner areas, Resilience, Social inclusion

1. Introduction

Since the end of the Second World War, Europe has developed a long-lasting tradition in policies for territorial development due to a high presence of inner areas (most of which are rural and mountainous) inside its political boundaries (Torre, 2015). These areas are mainly characterized by underutilization of development potential and strong inequalities in essential services access and quality. These factors trigger a chain process that has led to depopulation and the loss of economic development opportunities, together with a weakening of local communities well-being (Martinelli, 2020; Tantillo, 2015).
The growing interest for inner areas like fragile peripheral and semi-peripheral zones of the European region has resulted in an increase of public and private intervention programs (e.g. LEADER Program, Cohesion policies, European Agendas). The 22% of the Italian population lives in those areas, which correspond to about 60% of the entire country and include more than 4,000 municipalities.
For this reason, in 2013, following the European cohesion policies goals, the SNAI - Strategia Nazionale Aree Interne was launched to support Italian marginal areas (that currently counts 72 areas) to reverse demographic trends; reduce emigration; attract new inhabitants; create new income opportunities and improve accessibility to essential services as well as preserving territorial resources.
In general, both at the European and Italian level, there is a pervasive consciousness of the natural-cultural-economic richness of inner areas that, although abandoned, represent relevant potential leverage to contrast social, environmental, as well as economic welfare crises exacerbated in these last years by a natural disaster, the COVID pandemic and migration phenomena in Mediterranean world region (Torre and Wallet, 2015). In inner and rural areas, the territorial development policies' approach has gradually shifted from an "exogenous" approach with external investment in infrastructures and modernization of agriculture towards a "place-based" and "participatory" one (Osti and Jachia, 2020).

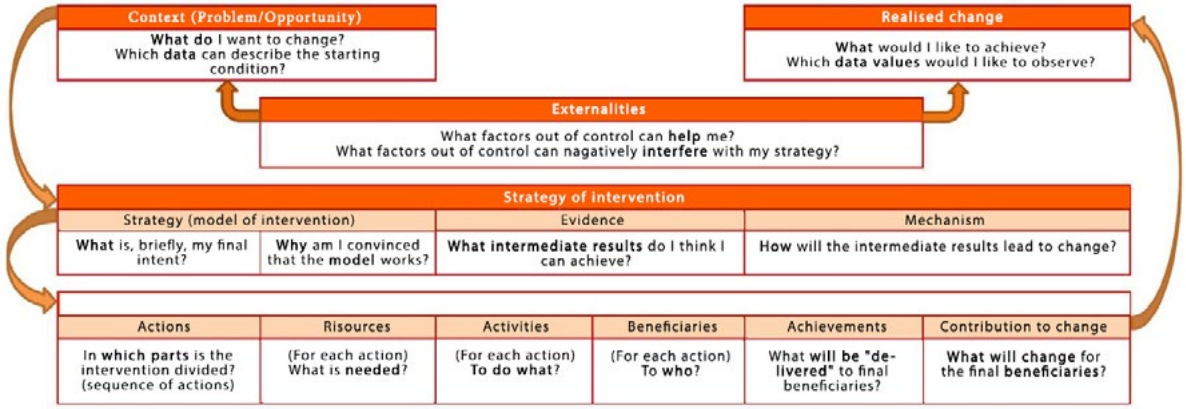

Fig 1. Theory of Change. Example of a logic framework (Fondazione Cariplo, 2018).

This means that participation in policy-making processes is an essential prerequisite to identifying specific local needs and constructing a feasible and sustainable approach. As also claimed in the last EU Agenda 2030, sustainability also starts from social inclusion. Growth and social inclusion, therefore, are mutually interdependent.
Remarkably, in parallel to policies transformation in terms of targets, goals and approaches, evaluation processes have also converged on new operational models and approaches to respond to "place-based" and "participatory" instances. Not by chance, strategic actions are no more addressed to pursue a result or foster a change only, but they represent themselves as a learning process that starts from the involved communities, with special attention to the spatial and temporal distribution of impacts (Oppio, 2021). Thus, the result is not expected once the policy has been implemented, but intermediate outcomes are expected as a part of the process. Consequently, these partial results need robust monitoring and evaluation frameworks to guide and control the process while learning from each phase of the applied strategy (Calderini, 2020; Evalsed, 2013).

2. The Theory of Change as a strategic evaluation framework for social sustainability and resilience of inner areas

Within this context, the Theory of Change ("ToC") gives a significant contribution to the traditional approaches for communities' enhancements and integration of international programs.
The ToC has its roots in sociological studies in the 50' (Connell et al., 1995) but was theorised and introduced for the first time by C. H. Weiss as a strategic tool in the US during 90'. In the Weissian view, ToC can be defined as a rigorous yet participatory process whereby communities and involved stakeholders in planning or decision making processes with a complex background articulate their long-term goals and identify the conditions they believe have to unfold for those goals to be met (Weiss, 1998). These "conditions" are modelled as desired outcomes, arranged graphically in a causal framework or logical framework.
Operationally, as shown in Figure 1, starting from the support of a logical framework map, the ToC approach describes the types of interventions of a strategy and the outcomes depicted in the map. According to the logical framework, each intervention is tied to an outcome, revealing the often complex web of activities required to bring about change. The framework provides a working model against which to test hypotheses and assumptions about what actions will best produce the expected outcomes. An essential role is played by the involved participants, who have to answer the following question: "What medium-long term change we want to reach with our effort addressed to the final beneficiaries and what are the best pre-conditions to obtain it?" (Fondazione Cariplo, 2018; Vogel, 2012).
ToC can be both a planning and issue-framing tool like a monitoring and evaluation tool. However, in all cases, an Impact Management & Evaluation based on a solid set of indicators is necessary to ensure the approach's success and foster participants' learning process.

3. Objective and results

In this article, the authors explore the use of ToC concerning its application on a policy for a place-based and participatory enhancement of inner areas communities' conditions, with a special focus on evaluation implications and the strengths and limits of the approach.
The case study on which ToC is applied is the Italian AttivAree Program, considered by literature as a successful case and that has a particular concern with actions on cultural heritage and local communities' involvement.
AttivAree Program was launched by Fondazione Cariplo (FC) in 2016 and completed by the end of 2020 (with a budget of 10.000.000,00 € co-financed by FC and the involved municipalities) for two marginal areas of the Lombardy Region: the mountainous areas of Valtrompia and Val Sabbia in Brescia Province.
AttivAre, through the local cultural heritage as leverage, has promoted territorial attractiveness (from both social and economic points of view) and sustainable local development of the two valleys (Badiani, 2020). The "sustainability targets" have been addressed to valorise all resources – economic, social-cultural, and environmental – like strengthening a sense of cooperation, solidarity, and territorial identity. Next to the sustainability concept, the strategy has fostered territorial resilience, intended as a more radical process in which the local population acquires knowledge and competencies to autonomously manage and improve the proposed system, built together with AttivAree Program.
Fondazione Cariplo has defined a monitoring and evaluation system as one of the most important and cross-sectorial actions for guiding the entire life cycle of the program. Thus, a great effort has been spent in selecting proper output, outcome and impact indicators according to the ToC paradigm. This set of comprehensive indicators and a robust governance system have been included in order to guarantee a continuous and efficient control of the strategy implementation while stemming a sense of cooperation and participation of local communities and, under a sustainability and self-resilience principle, transferring strategic and innovation capabilities to citizens and institutions (Fondazione Cariplo, 2017; Osti and Jachia, 2020).

4. Conclusion

Across the last months of the program implementation, after the conclusion of most strategic activities, FC published preliminary data on the impacts of the AttivAree Program through counterfactual methods (Osti and Jachia, 2020). However, the evaluation of the Program impacts will be launched three years after the conclusion and it will concern the variables already included in the preliminary assessments and those measuring the well-being of the inhabitants. The latter variables will be detected through a double survey to the local communities (the first survey has already been done, and the second will be submitted). By starting from the variables considered in the preliminary impact assessments, the article will investigate the role of the Theory of Change in the construction and choice of indicators and its contribution to the strategy construction process, with a special focus on the strengths and criticalities of the approach itself.
Finally, a further research achievement is to provide a basis for future developments in evaluation models and tools to strengthen the effectiveness and the operability of the Theory of Change, while promoting a combined use of qualitative (based on values and beliefs) and quantitative (based on evidence) data.

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Con(temporary) urban regeneration processes and real estate market: evidence from the case of Milan

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Abstract

In the last decades, the emergence of new social, environmental, and economic demands, exacerbated by the Covid-19 pandemic, has led urban planning to innovate its themes, methods, and approaches. In this context, temporary urbanism has emerged as a mainstream approach. However, the impacts of temporary approaches in urban planning are far from being fully understood. In this light, the research focuses on one of the mainstream approaches to temporary urbanism, tactical urbanism, and tries to understand its impacts on contemporary cities through the real estate market lens. After briefly introducing tactical urbanism's main reasons and features, it delves into the description of a structured experience of tactical urbanism in Italy: the municipal program "Piazze Aperte" in Milan. This experience is analyzed regarding its impacts on the real estate market. This preliminary analysis shows a positive effect of tactical urbanism on the real estate market.

Keywords

Temporary, urban regeneration, tactical urbanism, real estate market, impacts

1. Introduction

In the last decades, the emergence of new social, environmental, and economic demands and the evident failure of traditional planning have led urban planning to deeply innovate its themes, methods, and intervention approaches (WCED, 1997; Oswalt, 2006). Indeed, its primary focus has shifted from governing urban expansion and radical transformations to regenerating consolidated cities by giving prominence to the themes of reversibility and reuse (Carmona, 2012; Inti, 2019).
The Covid-19 pandemic has sped up this change of attitude toward temporariness in the urban agenda by raising the need to find solutions to react to unexpected events and ongoing societal and technological changes promptly (Bishop & Williams, 2012). Furthermore, the pandemic constraints have strengthened the attention to public outdoor spaces as essential elements to implementing urban quality and ensuring urban communities' psycho-physical well-being (Sharifi & Khavarian-Garmsir, 2020).
Based on this cultural ground, temporary urbanism, linked initially to self-organized and spontaneous experiences (Hou, 2010), is emerging as a mainstream approach to dealing with vacant and neglected areas within urban policies (Madanipour, 2018). However, the current scientific debate is divided on the role and impacts of temporary planning approaches in re-shaping our cities. Indeed, on the one hand, these approaches are recommended as quick and tailor-made solutions to promptly meet the rapid changes required by contemporary cities. On the other hand, they are criticized for the risk of being mere marketing strategies and for the uncertainty of their effects in the long-term scenario (Brenner & Theodore, 2002). What is true is that nowadays, the impacts of temporary approaches in urban planning are far from being fully understood and assessed (Cariello, Ferorelli & Rotondo, 2021).
In this light, the research focuses on one of the mainstream approaches to temporary urbanism, tactical urbanism, and tries to understand its impacts on contemporary cities through the real estate market lens.
After briefly introducing tactical urbanism's main reasons and features, it delves into the description of a well-structured and institutionalized experience of *tactical urbanism* in Italy: the municipal program

Fig 1. Comparison between the open space in Dergano before and after the *tactical urbanism* intervention (Milan municipality website)

a well-structured and institutionalized experience of *tactical urbanism* in Italy: the municipal program *"Piazze Aperte"* in Milan. This experience is analyzed in terms of impacts on the real estate market, and, based on the analysis results, some conclusions and critical reflections are drawn.

2. Tactical urbanism as con(temporary) urban regeneration and new values creation process

In recent years the paradigm of temporary urbanism has been declined through multiple forms of short-term actions: i.e. *autonomous geographies* (Pickrell & Chatterton, 2006), *guerrilla urbanism* (Hou, 2010), *DIY Urbanism* (Finn, 2014), *pop-up urbanism* (Harris, 2015). Among these various forms of temporary urbanism, which differ in their interpretation of temporariness (Bragaglia & Rossignolo, 2021), *tactical urbanism* has emerged as a mainstream approach for a temporary approach in the urban agenda.
Tactical urbanism is defined as "an approach to neighborhood building and activation using short-term, low-cost, and scalable interventions and policies" (Lydon & Garcia, 2015, p. 2). Despite other temporary urbanism approaches, which rest on explicitly challenging dominant and institutional urban development strategies, it can be "used by a range of actors, including governments, business and non-profits, citizen groups, and individuals" (Lydon & Garcia, 2015, p. 2). In its grounding on an open and iterative process and leveraging the potential of social interaction, "*tactical urbanism* doesn't propose one-size-fits-all solutions, but intentional and flexible responses" (Lydon & Garcia, 2015, p. 3). It is not easy to date the entrance of *tactical urbanism* into the urban agenda since it is possible to find several historical precedents of this impulse to create "temporary and low-cost impulses to the challenges of urban life" (Lydon & Garcia, 2015, p. 25). However, its rise and spreading can be dated back to 2010 in North America under the pressure of four relevant phenomena: People coming back to cities, the Great Recession, the spreading of the internet, and the growing detachment between government and communities (Lydon & Garcia, 2015). Then, this 'innovative' approach to urbanism has rapidly spread to Europe, leading to the birth of several relevant experiences of *tactical urbanism.* Among them, the

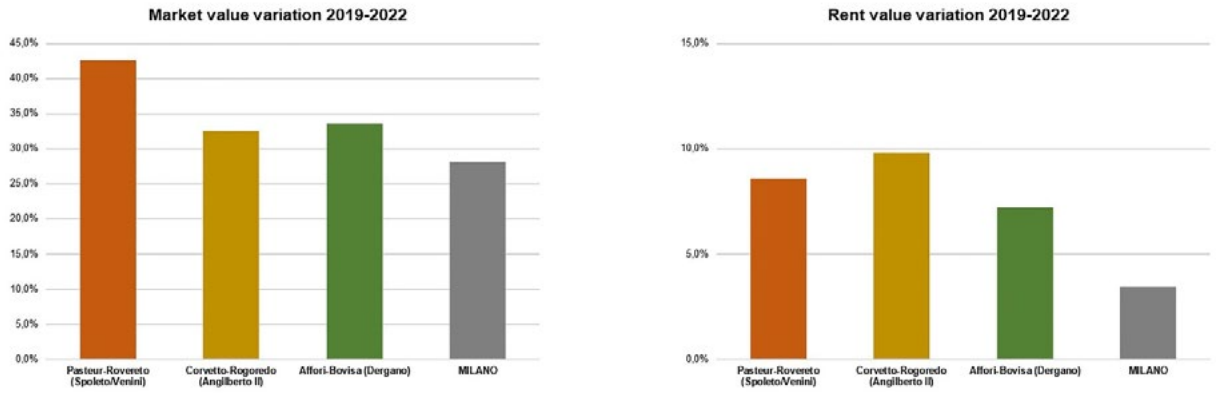

Fig 2. Comparison between the market and rental values' variation from 2019 and 2022 in the study areas and the average deviation in the whole Municipality of Milan

research focuses on the program *Piazze Aperte,* launched by Milan Municipality in 2018, to understand the impacts of *tactical urbanism* interventions on the consolidated city through the real estate market lens.

3. Tactical urbanism and real estate market in Milan

3.1 The *Piazze Aperte* Program in Milan

Piazze Aperte (Open Squares) is a program launched by Milan municipality in 2018 to bring open spaces back to the center of neighborhood spatial systems and communities' life. It is devoted to converting former streets and parking areas into equipped public spaces through *tactical urbanism* techniques (Comune di Milano, 2021a). This preliminary phase of the program involved four places in the municipality (*Dergano*, *Angilberto II*, *Porta Genova*, *Spoleto/Venini*). After these interventions, strongly participated by citizens, but in areas selected by Milan municipality, the program evolved into *Piazze Aperte in Ogni Quartiere* (Open Squares in each neighborhood) by involving citizens in each step of the process: from the area proposal to the co-design and the realization of interventions (Comune di Milano, 2021b).

3.2 The impacts of *tactical urbanism* on the real estate market

To understand the impacts of *tactical urbanism* on the real estate market by looking at the case of the *Piazze Aperte* Program in Milan, the research focuses on three of the pilot interventions conceived within the program: *Dergano, Angilberto II, Spoleto/Venivi* [Fig. 1]. These three interventions aim to pedestrianize the considered areas and create equipped public spaces by painting its flooring and installing a bike-sharing station, planters, benches, and ping pong tables.

By looking at the trends in the real estate market and rental values in the areas characterized by *tactical urbanism* intervention (www.immobiliare.it), it is possible to reflect on the potential impacts of this approach to urbanism on the residential market. More in detail, by comparing the variation of the market and rental values in the study areas from 2019 (all these interventions were implemented between 2018 and 2019) to 2022 with the average deviation in the whole municipality of Milan, it is possible to observe a higher variation in the areas interested by tactical urbanism intervention [fig. 2].

This result, of course, cannot be considered significant since it is influenced by the growing attraction of peripheral areas in Milan due to the dramatic increase in real estate values. However, it is confirmed by comparing the variation in market and rent value between 2019 and 2022 in the areas involved in the Piazze Aperte program with those in the surrounding areas, characterized by the same OMI classification (www.geopoi.it). Indeed, the market values in the *Piazze Aperte* areas are higher than the ones in the surrounding areas, with a positive gap ranging from 4% to 18% [fig. 3].

The same trends can be observed referring to the rent values, with a positive difference ranging from around 2% to 5,5% [tab. I].

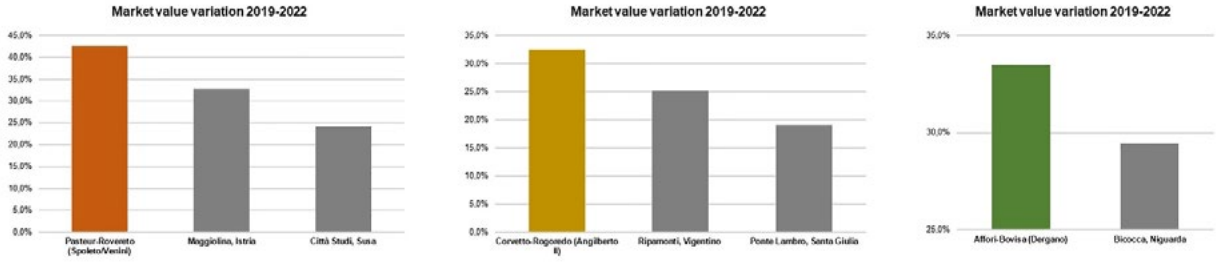

Fig 3. Comparison between the market values' variation from 2019 and 2022 in the study areas and the same deviation in the surrounding areas

Tab I. Comparison between the rental values' variation from 2019 and 2022 in the study areas and the same deviation in the surrounding areas

	Pasteur Rovereto (Spoleto/ Venini)	Maggiolina Istria	Città Studi Susa	**Corvetto Rogoredo (Angilberto II)**	Ripamonti Vigentino	Ponte Lambro Santa Giulia	**Affori Bovisa (Dergano)**	Bicocca Niguarda
RENTAL VALUE VARIATION 19-22	8,6%	3,3%	5,6%	9,8%	4,2%	3,7%	7,2%	5,5%

5. Critical reflections and conclusions

In recent years *tactical urbanism* has been gaining prominence as an effective approach to deal with the rapid changes in contemporary cities, exacerbated by the Covid-19 pandemic. However, the impacts of this kind of temporary approach in urban planning are far from being fully understood and assessed. In this light, the research aims to understand the effects of tactical urbanism on contemporary cities through the lens of the real estate market.

The analysis of the *tactical urbanism* interventions within the Piazze Aperte program in Milan focuses on the variation of real estate residential market and rent values, considered a proxy of consumers' appreciation of a specific place.

Based on the comparison with the average values in Milan municipality and with market and rent values in the nearby of the ones included in the Piazze Aperte Program, this preliminary analysis shows that *tactical urbanism* seems to affect both market and rent values positively.

Of course, this research represents an initial step towards comprehensively assessing the impacts of *tactical urbanism* on contemporary cities. Indeed, on the one hand, it is necessary to broaden this assessment to further impacts, such as environmental and social ones. More in detail, in light of the public nature of these interventions, it is essential to adopt a social perspective toward *tactical urbanism* by carefully considering local communities' reactions and feedback. Furthermore, it would be helpful to compare the Milan case study with other examples of *tactical urbanism* interventions in small and medium Italian cities. Finally, the real estate market analysis should be declined at a more detailed scale by applying a *hedonic price model*, thus allowing to precisely appraise the impact of *tactical urbanism* interventions on the market value formation.

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Turkey is the Leading Housing Producer in Europe with Dominating Equity Finance in Housing Transactions

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Abstract

House building industry in Turkey is the leading housing producer in total floor areas among European countries. Housing starts have been much greater than the needed number of dwelling units in many years, but new housing construction also includes summer cottages, mostly along the seashores. Completions follow more closely the need and changes in housing demand than starts. Because of inflation problem, housing investment serves as a hedge against inflation, especially when prospects for real returns from alternative investments are negative. This should be the reason of much higher share of equity finance compared to mortgage finance in housing transactions in Turkey. In this paper, the factors that contribute to producing greatest amount of housing in Europe will be studied.

Keywords

Housing need, housing supply, housing demand, neoliberal development, financialization in housing.

1. Housing need and production

Construction statistics, published by the State Institute of Statistics in Turkey, show that about 77% of total floor areas in building construction permits that have been issued between 2002-2021 were for housing. Housing need and demand in Turkey can be subdivided into 5 categories:

1. Population growth and continuing rural-urban migration, although at decreasing rates, create the basic need for housing.
2. Rising per capita incomes in time, increasing car ownership that stimulates urban sprawl and suburbanization, and desires to move from multi-story apartment housing at inner cities to newly built housing estates at the outskirts of cities with many structural and environmental amenities are the reasons for the demand for higher quality housing at a new location.
3. Turkey has to deal in recent years with refugees that escaped from armed conflicts at neighboring countries, as well as illegal migrants, totaling more than 5 million inhabitants. These people create additional housing need in cities where they settle.
4. Rebuilding of unauthorized built housing continues, either in special project packages or in accordance to urban development plans for the renewal of regularized areas. Currently, the major renovation issue is related to about 6,5 million dwelling units that are subject to high disaster risk; most of them have to be rebuilt. A special Law was enacted in 2012, and about 800 thousand buildings have been pulled down by the end of 2021, and new buildings are built in their place.
5. Holiday homes should not be counted within the need category, but they are an important part of the housing demand. House builders in Turkey are much involved in the production of holiday homes alongside housing for full year use, although these two housing types are not differentiated in published statistics of building construction.

Estimated yearly housing need goes up to about 700 thousand dwelling units when needs in all these categories are added together. The number of newly formed households in the 2002-2020 period, which

does not include households in renewed housing and holiday homes is calculated as 8,6 million. Housing starts and completions in the same 20 years were 12,5 million and 9,8 million dwelling units, respectively (TSI, 2002-2020). About 1,2 million difference between completed housing and the increased number of households, may partly be related to the 800 thousand housing units that were pulled down for rebuilding within the scope of the special Law, and partly to holiday homes construction. The big difference between starts and completions, as much as 2,7 million dwelling units, indicates a big backlog of housing under construction. It can be said that, together with housing under construction, housebuilding industry in Turkey is producing as much housing as needed.

Construction statistics published by the Turkish Statistical Institute do not indicate whether matching demand with supply in the housing market process is achieved, because these statistics are only on building permits, construction cost and housing transactions, so that we cannot say if as much affordable housing is produced for different income groups or are made available from the existing stock in housing transactions or for rent. Since as much needed number of housing is produced and transactions are about twice of the housing need, there should not be too much discrepancy between required and available affordable housing. Turkish housebuilding industry is highly successful in producing low cost housing for moderate to lower income population. Formerly unauthorized built and then regularized housing sites have been an important source in this endeavor of house builders.

One factor that makes Turkey the leading housing producer in total floor areas in Europe is that average floor area per dwelling unit is large; it has gone up to 161 m2 in construction permits of 2021. This can be attributed to the relatively low construction cost in Turkey, which can be related primarily to the availability of labor at low cost.

2. Neoliberal developments and financialization of housing

In academic research two factors are mentioned as the most important drives behind producing great amount of housing in Turkey: First, neoliberal developments in the national housing market and housing policies of the State in that direction, second, financialization in housing.

Neoliberal housing development is related to increasing role of the private sector and their encouragement to undertake large scale development projects, including housing, deregulation of the management of business activities and introducing new regulations and policies with the aim of creating greater space for the activities of the private sector, decreasing public sector's involvement in economic activities, privatization of public properties and decommodification of housing. Privatization of large tracks of valuable land in Istanbul with redefined development rights to enable new owners build large size commercial and/or housing projects, and private sector's involvement with similar projects by their own initiatives are mentioned as examples of neoliberal developments in Turkey (Guzey, 2014; Kayasu and Yetiskul, 2014, Korkmaz and Alkan Meshur, 2021).

Housing production in great amounts is not concentrated only in large cities in Turkey. In almost every region there is much housing and commercial building construction activity, which may be related to the well-developed construction industry. There are 555 thousand registered building contractors at the Ministry of Environment, Urbanization and Climate Change in March 2022, although not all of them may be active all the time. Since labor supply to the construction industry is highly elastic (because of the high unemployment rate in Turkey), builders in such a great number produce housing where there is a demand for that. Bramley (2013) indicates that shortage of developed land because of the restrictions in the spatial planning system is a very important factor in insufficient amount of supply and high price increases in housing markets. House builders in Turkey can acquire land, which is the primary input for housebuilding, in most cities without much difficulty, because municipalities can prepare and approve land development plans since the Urban Development Law was enacted in 1984 (Turel and Koc, 2014). This Law has been instrumental in speeding up plan making and approval processes. In cities where land subdivision planning is undertaken for the planned areas without much delay, sufficient amount of land is produced, as required by developers of housing and other buildings. Great amounts of housing and other buildings construction in Turkey are an indication that planning system is well adopted to meet the land development requirements of the construction industry.

In this paper, regional variation of housing production in Turkey will be presented in order to investigate the

effects of local and global factors in housebuilding in Turkey.

Financialization in housing has been a much researched issue in recent years in many countries. A number of studies have also been undertaken on the financialization of the housing sector in Turkey (Erol, 2019; Erguven, 2020; Yesilbag, 2020; Aslan, 2021). Mortgage financing started in Turkey with the establishment of a State owned bank in 1924, one year after the establishment of the Republic (Turel, 2015). Some State institutions were also assigned with the duty of the provision of mortgage credits by early 1950'ies, but they could not continue long with this task because of inflation.
Commercial banks' involvement with mortgage finance began after the 2001 financial crisis era in Turkey with the fall in inflation. The number of people with a positive mortgage credit balance reached to only 106,7 thousand at the end of 2004 (The Banks Association of Turkey, 2022). It has been shown that Turkish companies, including construction firms, borrowed large amounts of money from international finance organizations when abundance of liquid at low interest rate was available. Many real estate investment trusts have been established and are involved with many real estate investments.
The number of mortgaged transactions of housing has rapidly increased. The share of mortgage credit users in yearly housing transactions fluctuates with interest rate. The number of housing transactions between 2013-2021 were 1,15-1,5 milyon and mortgaged sales were 39,9% in 2013, remained between 33% and 34% level in the following 4 years, fell to 20% in 2018, increased to 24,6% in 2019, went up to 38,2% in 2020 due to big subsidies in the interest rates by 3 State owned banks in order to save house builders from the negative effects of the pandemic, and fell back to 19,7% in 2021. These figures indicate that equity financing dominates housing transactions. In crisis-free years, about one-third of house buyers use mortgage credit, but during crisis years the share of mortgaged transactions decrease to 20% level even when as much as 1,5 million dwelling units are sold. It appears that, although finance is available and used in the housing sector, more people prefer to invest their savings in housing rather than investing in other investment items.
In this paper, taking into consideration high share of equity financing in housing transactions, the role and level of financialization in the housing sector will be evaluated.

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A Decision Aid and Social Impact Co-Assessment Approach for Urban Regeneration Processes

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Abstract

The consolidation of community urban regeneration processes makes it particularly necessary to investigate a collaborative dimension of social impact measurement in the perspective of greater social sustainability. Social impact assessment is increasingly configured as an enabling process both in the communities and in the institutions involved, capable of orienting the strategies of public institutions in support of urban regeneration culture and community-based. In this context, within the research agreement between the General Directorate for Contemporary Creativity (DGCC) of the Ministry of Culture (MiC) and the IUAV University, a methodological approach has been structured to co-evaluate the transformative impacts produced by culture-based urban regeneration projects supported by MiC. The co-evaluation process provided opportunities for reflection on how institutions could innovate and improve their strategies toward greater economic and social sustainability.

Keywords

social impact assessment, community-based regeneration, culture-based regeneration, transformative impact, reflexive evaluation

1. Introduction

In recent years, Impact Assessment (IA) and Social Impact Assessment (SIA) have been at the centre of the scientific investigation (Arena et al., 2015; Gray, 2001). The debate is rooted in the gradual transition from a Welfare State model to a Welfare Society model (Cicerchia et al., 2020; Skillen, 1985; Zamagni et al., 2015); in the scarcity of resources, which leads companies to demonstrate the value created and spread increasingly; in the new sectors of finance that link economic investments to social objectives; in the new calls for proposals that incentivize urban regeneration and social innovation projects. In Italy, the Guidelines for Social Impact Assessment (Legislative Decree July 24, 2019) implements the "The Third Sector Reform" (Law 106/2016), introducing the need for the third sector association and entrepreneurship to make tangible the impacts generated and to verify the process efficiency and effectiveness (O'Flynn, 2010; Vanclay, 2003).
Therefore, if in the past the evaluation was part of the "reporting" logic through the measurement of outputs and performance, in the era of generative welfare, the assessment of the impact implies "giving value", highlighting the tangible and intangible aspects that mark the change generated by urban regeneration processes. In this context, the shift from the logic of production for beneficiaries to the co-production of services with beneficiaries requires considering the transformative potential of regenerative actions capable of generating transformative impacts (Strasser et al., 2019) and approaches and methods proper to co-evaluation. In the new evaluation collaborative perspective, at least four principles around which the role of evaluation is redefined (Krogstrup & Mortensen, 2021): the centrality of communities, long-term results, the adaptive nature, and the enabling aspect. The stakeholders' involvement in the evaluation process (administrations, citizens, civil society, etc.) can

provide more effective and innovative solutions to social problems and grand challenges (Osborne, 2010). Going along with the reflective nature in the new evaluative wave, spaces for reflection open up during the evaluation process. The evaluators assume an attitude of humility and design inclusive and productive interactions to facilitate interactive learning toward the learning-by-doing approach (Verwoerd et al., 2020), moving from "knowable objective truth" to "understanding the world together" (de Jaegher et al., 2017) and acknowledging the plurality of perspectives and uncertainty.
In this perspective, the paper presents a methodological proposal of social impact co-assessment, structured and tested within the research agreement between the General Directorate for Contemporary Creativity (DGCC) of the Ministry of Culture (MiC) and the IUAV University of Venice. Among the convention's objectives was to evaluate ex-post the impacts generated by projects implemented in Italy through the public calls promoted by MiC, "Creative Living Lab", and "PrendiParte" in support of culture-led urban regeneration projects. At the same time, the need emerged to outline, in a manner shared with the stakeholders involved, areas of reflection capable of orienting the company's future strategies towards greater economic and social sustainability.
The paper has been articulated into the following sections: Materials and Methods, with the methodological proposal, Results, Discussion and Conclusion.

2. Materials and Methods

The research program examined all culture-based urban regeneration projects supported by MiC through the national calls for proposals "Creative Living Lab" (2018-2019) and "PrendiParte" (2018). The projects were grouped into thematic clusters defined from the characteristics most shared by the projects, so six case studies were chosen following the subsequent criteria: homogeneous geographical distribution on the national territory, criteria of representativeness and diversification of the main variables that characterize the different projects. Three types of stakeholders have been identified with relative three different types of impact to set up the collaborative evaluation process (Cerreta et al., 2020, 2021). The three roles are the following: the Process Manager (PM), as the expert of the MiC expected impacts; the Project Manager (MP) of the selected project, able to explain the potential impact, interpreted by the objectives expected by the DGCC and potentially generated on its territory through the projects activated; the Users (US), citizens able to express the perceived impact of the activated project.
To achieve the objectives of the SIA and those required by the MiC, we started from the Theory of Change (ToC) approach to test the ex-post reconstruction of the Impact Value Chain (Leat, 2005; Valters, 2014; Vogel, 2012). Specifically, only outcomes and impacts were considered to reconstruct ex-post the impacts expected by the various stakeholders involved and compare them with those perceived in the territories [Fig.1], towards a cyclical perspective.
The main phases, tools and approach of the social impact co-assessment process were defined: selection of the main impact objectives; identification of primary outcomes; co-evaluation of the results; analysis and interpretation of the data that emerged [Fig. 1].
First, the main impact objectives expected by the MiC were identified by analyzing the purposes set by the MiC in the public calls. The main goals have been summarized into 4 thematic clusters: Culture and Creativity, Collaborative Regeneration, Innovative Entrepreneurship, and Partnerships.
Subsequently, the outcomes declared by the Project Managers during the tender phase were analyzed ex-post. The 13 goals most shared by the 6 selected projects were brought back to the 4 macro-objectives expected by the MiC [Tab I] and transformed into 13 questions to be submitted to the identified stakeholders.
In the third phase, the impacts co-evaluation was activated through interviews and focus groups. The 3 different stakeholders, for each project, were interviewed separately through 13 structured questions and 2 open questions aimed at identifying any impact domains not considered in the research phase. In addition, the users of a specific project, chosen through a randomized control, were interviewed in a focus group, bringing out a single shared assessment. all interviewees expressed an opinion on the impact indicator using the Saaty scale (Saaty, 1987) and commented on the motivations, thus collecting comparable quantitative and qualitative data to explore the issues in greater depth.
In the fourth phase, the resulting data were returned through a spider diagram (also Kiviat or radar diagram) (Centis & Micelli, 2021; Cerreta & Giovene di Girasole, 2020) for each project analyzed to compare better the results perceived by different stakeholders from the same project. The graph's

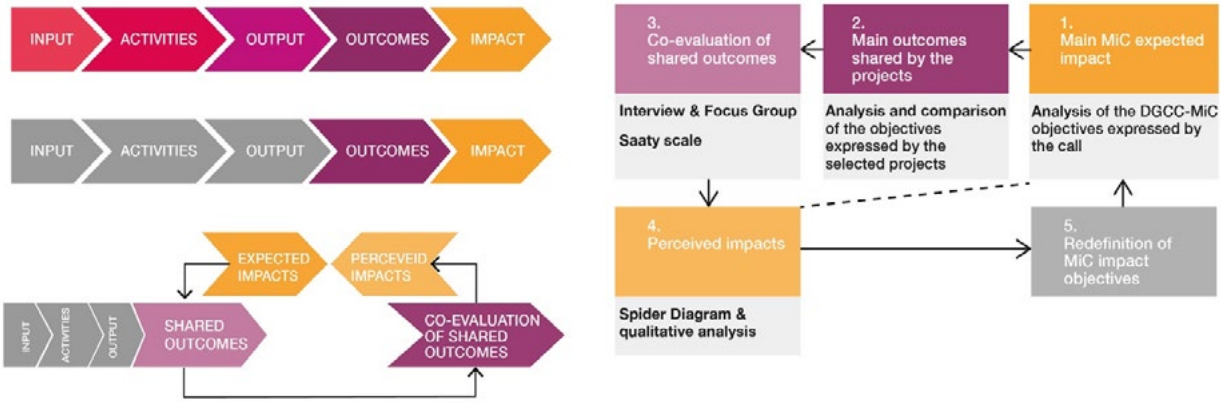

Fig 1. From the Theory of Change to the Co-Evaluation: a methodological approach for the Social Impact Co-Assessment process (Credits: authors, 2022)

vertices coincide with the 13 outcomes connected to the 4 main impact objectives.
Furthermore, through keywords, textual paragraphs were drawn up in which the main issues were reported concerning which the interviewees showed particular convergence or divergence.

Table I. The 4 main impact objectives and the 13 outcomes

Objectives		Outcomes
1. Culture and Creativity Implement and diversify cultural, creative and social activities	**1.1**	Promoting the inclusiveness and accessibility of the artistic-cultural offerings
	1.2	Promote the integration and diversification of local cultural and creative actions
	1.3	Encouraging the integration of technological tools in the cultural and creative field
	1.4	Contribute to greater ecological and environmental awareness through artistic-cultural experiences
2. Collaborative Regeneration Increase the reuse and transformation of abandoned and/or underused spaces through processes of community participation and involvement	**2.1**	Increase and revitalize intergenerational and intercultural exchanges in regenerated spaces
	2.2	Increase the usability and quality of spaces ensuring accessibility to all
	2.3	Increase the attractiveness of places by encouraging contamination between local and temporary communities
3. Innovative Entrepreneurship Encourage the birth and/or growth of entrepreneurship in the cultural and/or social sphere	**3.1**	Activate enabling and professionalizing environments in the creative and cultural field
	3.2	Encourage the development of an entrepreneurial spirit in the cultural and/or social field in its territory
4. Partnerships and networks Encourage the establishment of multidisciplinary territorial networks and empowerment processes	**4.1**	Implement paths of co-design of territorial activities
	4.2	Stimulate paths of comparison and multidisciplinary learning in the artistic and cultural field
	4.3	Establish new networks, lasting over time, among local realities (e.g. associations, administration, schools, universities, etc.)
	4.4	Promote channels of collaboration between territorial networks and public administrations

3. Results

The values expressed by the different stakeholders in 3 satisfaction rankings of the outcomes have been compared to each other [Fig. 2]. To facilitate the critical reading of the graph, convergence analysis of the points of view was set up. The average between the opinions expressed by the different stakeholders represents a "convergence index" (CI) which implies a greater or lesser correspondence between the interviewees concerning the outcome investigated (convergent, moderately convergent, not very convergent or not convergent).

CULTURE AND CREATIVITY	COLLABORATIVE REGENERATION	INNOVATIVE ENTREPRENEURSHIP	PARTNERSHIPS AND NETWORKS

	Expected impacts (PM)	Value
1.1	Inclusiveness and accessibility	8
1.2	Integration and diversification	8
1.3	Technological innovation	8
2.1	Community involvement	8
3.1	Hard and soft skills transmission	8
1.4	Ecological awareness	7
2.2	Usability and accessibility	7
2.3	Attractiveness and identity	6
4.3	Economic and social productivity	6
3.2	Generativity and employment	3
4.2	Multidisciplinarity	3
4.1	Cooperation	2
4.4	Trust in institutions	2

	Generated impacts (MP)	Value
1.3	Technological innovation	9
2.1	Community involvement	9
4.2	Multidisciplinarity	9
3.1	Hard and soft skills transmission	8
4.1	Cooperation	8
1.1	Inclusiveness and accessibility	7
1.2	Integration and diversification	7
1.4	Ecological awareness	5
2.3	Attractiveness and identity	5
2.2	Usability and accessibility	3
3.2	Generativity and employment	3
4.3	Economic and social productivity	3
4.4	Trust in institutions	2

	Perceived impacts (US)	Value
2.1	Community involvement	9
2.2	Usability and accessibility	9
1.2	Integration and diversification	8
1.4	Ecological awareness	8
3.1	Hard and soft skills transmission	8
4.1	Cooperation	8
4.2	Multidisciplinarity	8
1.1	Inclusiveness and accessibility	7
2.3	Attractiveness and identity	7
4.3	Economic and social productivity	7
4.4	Trust in institutions	7
1.3	Technological innovation	6
3.2	Generativity and employment	3

Fig. 2. Rankings of the satisfaction of the outcome (Credits: authors, 2022)

The results show that the impacts related to new employment and innovative entrepreneurship, expected by both Project Managers and Process Managers, were not fully satisfied, falling in the last positions of the ranking. Conversely, community involvement resulted in a higher degree of shared satisfaction. In contrast, community involvement and the inclusivity and accessibility promoted by the projects evaluated found a higher degree of shared satisfaction among all stakeholders interviewed. On the one hand, this confirms how the protagonism of the inhabitants in culture and community-based processes is a guarantee of success in achieving the expected impacts. On the other hand, however, it emerges that the issue of sustainability and economic generativity is not a perceived impact. Similarly, implementing the projects does not help increase trust in institutions, especially for project leaders who collaborate by acting in public space. In addition, some of the themes that emerged open up interesting areas of reflection for MiC, such as: “supporting processes that have already begun or new projects”, which implies funding for organizations that have already been structured over time in the area of reference; "the role of technology and ecology in the cultural and artistic offer"; "employment in the cultural sphere".

4. Conclusion

The proposed methodological approach defines a collaborative tool (Mangialardo & Micelli, 2017) flexible and easily replicable over time through interviews and focus groups, and through a quantitative evaluation system (Saaty), therefore comparable and qualitative (responses and free conversation), to enter into the merits of the judgments expressed. By cross-referencing the data obtained, the institution, directly involved in the evaluation process, is called upon to question its strategies in the light of the convergences and divergences that have emerged among the various stakeholders, comparing the perceived impacts with those initially expected by the Ministry. The intention is to follow up this first part of the research with another, more solid evaluation process. The indicators that emerged compared to the stakeholders and those dimensions of impact not expected, but found ex-post, will be examined vertically. Subsequently, the objective is to quantitatively expand the survey to all other cases supported on a national scale.

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Beauty as value: evaluation issues in the NEB perspective

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Abstract

The occasion of the second edition of the BALL 2022 conference, regarding architecture, planning, as well as design fields and conceived in accordance to the New European Bauhaus initiative, allows us to go back to thinking about the Beauty, its multiple values and possible evaluation approaches. Since 'Beauty at European level is an explicitly declared objective of planning, design and place-making, encouraging Beauty and its relationship to society means enhancing communities' values. In this perspective, while many multidimensional decision support models have been developed and implemented in the domain of environmental sustainability, the evaluation of Beauty, meant as a generative design principle as well as an objective to be achieved and monitored over time, is still a challenging research matter. Thus, the aim of the contribution is to focus on the role that evaluation can play for including Beauty as a purpose for a value-focused design and planning.

Keywords

NEB, Beauty, values, evaluation

1. Beauty as an essential value

The New European Bauhaus (NEB), the project launched by European Commission in 2020, pursuing what stated by the Davos Declaration (2018), has enriched the European Green Deal with the cultural dimension, connecting it «to our daily lives and living spaces. It calls on all Europeans to imagine and build together a sustainable and inclusive future that is *beautiful* for our eyes, minds, and souls». (NEB, EC, 2020). The initiative, involving all the creative sectors, is based on "three inseparable core values": *Sustainability*, ; *Aesthetics* (; *Inclusion*. As in the COM (2021)573 final: «The challenge is to address all three values simultaneously to develop the creative solutions that best address people's needs at a lower overall cost». In this triangular perspective, from an economic and appraisal point of view those issues deserve to be highlighted. First of all, the initiative is founded on *values*. As known, values, that ideal entity that arises from human needs, allow individuals and communities to attribute an 'importance' to the actions, with respect to objectives, considered as 'evaluation criteria'. As consequence choices and actions, even those market-based or of economic nature, cannot be explained in the absence of values (Fusco Girard, 1990). For some of those who deal with appraisal and evaluation disciplines and who have tried to focus on the value of Beauty in architecture is relevant and admirable that the European Commission, by the NEB initiative, recognizes Beauty(or Aesthetic) as important as Sustainability and Inclusion. For the first time the European Commission places Beauty at the top of its political agenda, investing several funding resources (Cohesion policy funds, Horizon Europe and its relevant missions, creative Europe, Erasmus+, etc.), thus inviting the Member States to incorporate this value, together with sustainability and inclusion, in their local strategies and to mobilize the relevant parts of their recovery and resilience plans, for building a better future for everyone. With the NEB, Beauty has become a 'normative' principle, as Chiodo has recently highlighted (2019) «beauty should not be a luxury for the space of a few individuals, but the norm for the space of any individual… beauty can and should be normative in the following sense: it should be there, and it should be an essential value, because it makes us see

the following sense: it should be there, and it should be an essential value, because it makes us see both who we are and who, then, we have the duty to be, for us and for the others – and we have the duty to be who is capable of self-evolution and, consequently, of social evolution». In this perspective Beauty is strictly connected with its 'civic value': independently from its producer, client, builder or designer, it belongs ever to the city and its citizens. Since from the Directive 85/384/EEC, that has recognized the public interest of the architectural quality, a kind of 'common aesthetic sense' has been spreading at European level. Just Beauty, recognized as autonomous value/criterion, becomes in the NEB one of the main driver of development projects with a long-term *social value*. So Beauty «can be understood as a kind of European (and global) public good too: a set of qualities and activities that provide aesthetic pleasure to our senses and enhance our well-being in many ways» (Kononenko, 2021). In general terms no one can be excluded from the utility derived from Beauty, its presence creates benefits that go beyond the fiscal and the legal boundaries of the ownership. This common nature of Beauty, with its various material and immaterial dimensions, should be emphasized as it relates to *human rights*. Encouraging Beauty and its relationship to society means enhancing communities' values.

2. Toward a shared evaluation process

The evaluation of the above mentioned multiple benefits and positive externalities, although complex, deserves more scientific and operational attention, since Beauty has become an explicitly declared objective of planning, design and place-making at European level. The institutional documents and state laws in the European framework (Forte, 2019) demonstrate how there is a powerful convergence on the concept of architectural quality, on the evaluation processes related to it and on the essential criteria for its determination, among which Beauty plays an essential role. As highlighted in past study (Forte, FuscoGirard, 2009),several are the benefits/externalities emerging from architectural beauty: some are economic, some are social, some are cultural. The identification of these different values still remain complex, also because are many-sided the elements to consider and the interrelation among them. However, starting from the formulation of the 'social use value' notion, Italian appraisal and evaluation discipline has developed meaningful methodological frameworks and innovative approaches. Since the vision of the NEB is to align sustainability with aesthetic for Europe's green transition, fundamental is a shared understanding of the value of Beauty, its criteria and indicators. In this perspective the three planned phases of NEB: Design, Delivery and Dissemination, will help to create «networks and share knowledge in order to identify open and replicable methods, solutions and prototypes, making them available to cities, localities, architects and planners. Starting a dialogue with citizens, businesses and academia and strengthening urban institutional capacities will also be crucial». According to the NEB paradigm, multicriteria analysis seems to be the most adequate among the evaluation techniques for enhancing the 'quality' of a building or project (Fattinnanzi *et al*, 2018) with respect to the preferences of many stakeholders (clients, investors, users, designers, constructors, etc.). While many multidimensional decision support models have been developed and implemented in the domain of environmental sustainability, the evaluation of beauty, meant as a generative design principle as well as an objective to be achieved and monitored over time, is still a challenging research matter.

3. Future development

The aim of this contribution is to focus on the role that evaluation can play for including Beauty as a purpose for value-focused design and planning processes. First of all it is necessary to refer to a more objective and "trans-individual" concept of Beauty, with respect to its nature of public good and its role in "community satisfaction". Starting from a taxonomic approach, it will be possible to breakdown Beauty into a framework of categories/values. Due to its multidimensional nature, Beauty is a mix of elements stratified over time; it is not only linked to every single meaning dimension, but also to their particular "combination". In this perspective, evaluation can help to explore these relationships together with stakeholders' perceptions and preferences. Consistently with the notion of Beauty, the Value-Focused Thinking (VFT)) approach proposed by Keeney (1992) seems to be a promising line of

research in order to test whether an approach based on Beauty values can support the generation of quality design options. Shifting the focus from an alternative-based approach, where the role of evaluation is limited to choosing the most satisfactory alternative, to a value-based approach, in which evaluation plays a leading role in the whole process, starting from objectives' identification and modeling, can be considered as essential to foster Beauty into alternatives design. The iterative and flexible nature of the VFT, in addition to increase the awareness about objectives and values elicited by stakeholders, strengthens the ethical dimension of Beauty as guideline for preferences among choices.

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Creation of a Pseudo-Vernacular Architecture and the Unintentional Attainment of Sustainability: The Case of Akyaka Town Development

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Abstract

This study problematizes a case where the interpretation of local architectural types by a designer forms a pseudo-vernacular architecture that shapes the sphere of a newly developing small town towards one that became unintentionally sustainable.

The house built by Nail Cakirhan in Akyaka (Turkey) opens up a new future in front of the small village of then, towards becoming a touristic center with a specific architectural language of its own. Cakirhan builds the house for himself by getting inspired by the traditional houses of his hometown Ula, which is only a few kilometers away from the village of Akyaka. By means of interpreting traditional Ula house types, Cakirhan forms a new architectural language for Akyaka, which evolves into a pseudo-vernacular architecture. Since then, this invented architectural tradition has both transformed the village into a popular touristic town and created an unintentional sustainability due to its sensitivity for cultural and natural assets of the context. This architectural language is protected by the master development plan of the Municipality now, and the town is declared as a 'slow-city' due to its ecological, sustainable, human, and environment-friendly character.

In order to portray this development, this study will first examine Cakirhan house in relation to its inspired and current contexts, then it will observe the development of the town of Akyaka by means of looking at the other buildings of Cakirhan, the master development plan that protect the architectural language, and the development of the town as a sustainable, slow-city.

Overall, the architectural language and the development of Akyaka can be found debatable in terms of its authenticity; nevertheless, the outcome is still worthy of note in terms of discussing how a recent architectural practice can result in the development of a sustainable and harmonious architectural environment today.

Keywords

Pseudo-vernacular architecture, sustainability, town development.

1. Introduction

The story of Akyaka (Turkey), once a small village at the foot of Sakartepe mountain coasting the Aegean Sea, begins when a self-trained Turkish architect/master builder builds a small house for himself and his wife, on a lot that he bought close to his hometown Ula (Turkey). Nail Cakirhan (1910-1988), who was in fact a Turkish poet and journalist, became interested in construction after his forties while accompanying his archeologist wife Halet Cambel on her field studies. After a life full of turbulent events due to his sociopolitical views, Cakirhan started to work as a constructor of several projects in the 1960s, and in 1970, he and his wife moved to Akyaka, a province of the city of Mugla (Turkey), due to his worsening health (Cakirhan, 2005).

When in Mugla, Cakirhan saw that the traditional architecture he remembered from his childhood was gradually deteriorating due to reinforced concrete buildings that were slowly invading the whole country. Upon that, he decided to build a house for himself in line with the traditional architecture of the context,

standing clear from reinforced concrete (Cakirhan, 2005). He first examined local architectural types and characteristics of the traditional houses of his hometown Ula, which is 30 km away from Akyaka, and found two local carpenters there (the last remaining two) who knew traditional timber house-building of the area. Later, he started to build a house for himself in Akyaka together with them, following the traditional characteristics. The house he built amalgamated the characteristics of the traditional house types of Ula with contemporary necessities, and it was designed to be in one with the nature outside. After its completion, it gathered much attention, and Cakirhan received many commissions for realizing similar houses and buildings for his friends, villagers, people from other cities, and touristic establishments. Overall, he has designed and realized more than 30 buildings in Akyaka, which recreated the architecture of this small village from scratch and transformed the village into a popular touristic center. Due to the cultural and environmental sensitivity of his house and all the other buildings he has designed in Akyaka, Cakirhan was nominated to Aga Khan Awards for Architecture and was awarded with his own house in 1983 (Cakirhan, 2005; Uysal, 2012).
Afterwards, the town of Akyaka strongly embraced this architectural language created by Cakirhan and took the architectural unity sustained by it under protection with building rules and regulations. In 2011, due to the value the town attached to natural and cultural qualities, sustainable development, and unique, environmentally friendly architecture, it even got the title of 'slow-city'. This study will examine this developmental process that starts with the work of a designer and will try to gain an understanding of the potential of architecture in the creation of a sustainable and harmonious environment.

2. Cakirhan House in Akyaka, Mugla

Cakirhan house makes a straightforward reference to the traditional houses of Ula, the town where the designer spent his childhood. Ula is a small town in the southwest of the Anatolian peninsula, in the province of Muğla (Turkey). Enveloped by mountains on four sides, it is inland, 600 m's high from the sea level, and under the effect of the temperate Mediterranean climate (Aran, 2000).
Ula houses were developed to protect their inhabitants from the intense summer heat, deliver natural ventilation, and maintain privacy within their courtyards (Aran, 2000). There are three main types of houses in Ula, classified according to their *sofa* types. *Sofa* is the main living space of the traditonal Turkish-Ottoman house, where the rooms are opened towards. All located within a courtyard, the houses are either (1) one-storied, single-cell houses without or with a minimal, open, outer *sofa* (locally called *divanhane, hayat or haney*); (2) one or two-storied with an open, longitudinal, outer *sofa*, with two rooms flanked by an iwan in between them (locally called *mabeyn*); and (3) two-storied with a closed, outer or inner *sofa* (that is either rectangular or polygonal) with two rooms flanked by an iwan (Uysal, 2012). These houses are attached to one side of their courtyards, and their main spaces (the rooms and the sofa) look at the courtyard, generally towards the south. The rooms are multipurpose, and they act as living, eating, cooking, and sleeping spaces. The s*ofa* is covered on top by wide and ornamented timber eaves, but it can be open or closed on the sides. When the *sofa* is open on the sides as a porch, we generally see an ornamented timber trellis in front of it (Erarslan, 2018). All houses have unique courtyard gates (with double doors and a small inner door for daily use), a unique chimney type, and fireplaces in their rooms (bulged at the outer façade) with a pair of windows on their two sides. The windows are vertically proportioned and in pairs. All the houses have well-crafted timber ornamentations on their windows, doors, ceilings, and large eaves. The houses can be either stone masonry or in timber frame, but they are always white-washed with lime mortar, and are covered with timber frame pitched roofs (Uysal, 2012). As Cakirhan (1983) notes, maybe the most important characteristic shared by all these houses is their unity with nature, where the inhabitant can feel at the interior and the exterior simultaneously [fig. 1].
Akyaka, the town where Cakirhan house is located, is a seaside town that lies on the Southwest coast of Anatolia, on the valley at the foot of Sakartepe mountain, at the bay of Gokova. 30 km's away from Ula, Akyaka shares similar climatic and socio-cultural characteristics with Ula. Cakirhan house was built in Akyaka, in a 2000 m2 lot, on a cliff that is 20 m above the sea level, overlooking the sea. There are two masses in the lot, one is the house itself (147 m2), and the other is the caretaker's lodge (48 m2). The house was built in the lower half of the lot, faces south, and views the sea. As Cakirhan explains, the house was designed as a combination of two house types in Ula, one with the open, longitudinal, outer *sofa (divanhane)*, and one with the closed, polygonal, inner sofa *(divanhane)* (Cakirhan, 1983).

Fig. 1. Ula aerial view (left) (Source: Uysal, 2012); one-storied Ula house with an open, longitudinal outer *sofa* (middle) (Source: Aga Khan Awards for Architecture, 1983); two-storied Ula house with a closed, polygonal outer *sofa* (right) (Photograph by author).

Besides these two *sofa* types, the house also shares many other traits with traditional Ula houses, such as its ornamented double-winged courtyard gates, high courtyard walls (1.5 m high), timber frame construction with brick infill, white-washed exterior walls, unique chimneys, rooms with fireplaces with cupboard doors on each side, multipurpose character of rooms, ornamented vertical windows with wooden shutters, wide timber eaves, iwan-like space between the rooms (*mabeyn*), pitched timber roof covered with *alaturca* mission tiles, ornamented columns and arches of the longitudinal *sofa*, ornamented timber ceilings, built-in furniture, and a continuous shelf on the walls (locally called *serpenc*). Differently, the house has a kitchen and two toilets/shower rooms at the inside, rather than outside as in traditional houses; and *mabeyn* has been interpreted as a small corridor adjacent to the two rooms at its sides, connected to the polygonal *sofa,* which acts as the main living space of the house. Another important characteristic of the house shared with traditional houses is its unity with nature. As Cakirhan (1983) states, both the polygonal *sofa* and the two rooms on its sides open up to the longitudinal open sofa and the outside directly. Therefore, when all the doors are open, there is a continuous space between the rooms, *sofas* and the garden, and the house becomes one with nature (Aga Khan Awards for Architecture, 1983) [fig. 2].
Due its environmental and cultural sensitivity, harmony with nature, preservation of natural landscape, climatic consciousness, use of local resources, craftsmanship, materials and manufacturing, and interpretation of traditional living patterns, house types, and construction techniques, the house was awarded with Aga Khan Awards in 1983 (Aga Khan Awards for Architecture, 1983). The cultural, climatic, and environmental consciousness of the house also made it an early example of sustainable architecture. It used mostly natural and traditional architectural means for sustaining thermal comfort in the house, by its wide eaves, shaded porch, ventilation of hot air by wooden ceilings in the summer, and by the effective use of fireplaces in the winter. By means of all these characteristics, the house worked as an inspiration in the development of the town of Akyaka as a sustainable and slow city that values its unique architectural language.

3. Development of the Town of Akyaka Towards a Sustainable, Slow City

Since its completion in 1971, Cakirhan House drew much attention to itself, and many people wanted similar buildings for themselves from the designer. First to friends, then to other people, Cakirhan built more than 30 buildings in Akyaka, both houses and touristic establishments, which gradually started to form an architectural language for the town (i.e. Minu Inkaya House, Melih Cevdet Anday House, Heike-Thomas Toll-Schmitz House, Orkide Pension, Yucelen Hotel, Letoonya Resort Village etc.). In the 1980s, the once small and pristine seaside village became a popular touristic destination. In 1991, it first became a municipality, and in 2012, it grew to become a municipal district of the town of Ula.

Akyaka embraced its newly developed architectural language, and in order to protect and maintain it, it formed its master development plan with the guidance of Cakirhan himself. The plan determined building codes for the area, which required the houses to have large, timber eaves of 80-100 cm, vertical timber windows of 70 to 120 cm, pitched roofs with *alaturca* mission tiles, unique chimney type of the region, ornamented, arched timber columns in balconies and porches, timber decorations inside and outside, and white-washing of the façade (information acquired from Akyaka Municipality, 2013). The newly built

Fig. 2. Nail Cakirhan House in Akyaka. Southern façade (left) (Photograph by author); Northeast view (middle) and floor plan (right) (Source: Aga Khan Awards for Architecture, 1983).

Fig. 3. Akyaka aerial view (left) (Source: Akyaka Belediyesi, n.d); houses in Akyaka (middle and right) (Photograph by author).

buildings have created a synthesis of contemporary requirements and techniques with traditional elements and spatial characteristics. The buildings benefit from local resources by the materials that they use, and they are in good harmony with the natural environment and the climatic, social, and economic life of the town (Akyaka Belediyesi, n.d.). Overall, the town acquired an architectural unity by means of the language protected by the regulations [fig. 3].

The authenticity of this architectural language is of course debatable, since using the characteristics of a nearby, local architectural tradition to produce a pseudo vernacular language from scratch might pose the risk of deceiving the viewer to believe what he/she is viewing belongs to much earlier, traditional times. Many documents on conservation, such as Venice Charter (ICOMOS, 1964), warn us against the ills of this kind of an approach, stating that imitating historical architecture might mislead the community about the actual period of the work. Nevertheless, as recent literature problematizes now, authenticity is an elusive and unstable term (Bendix, 1999; Upton, 1993), and all kinds of authenticity should be evaluated by respecting the cultural diversity that created them (ICOMOS, 1994). It is found true that sometimes reinventions of cultural phenomena can become what is real or authentic for the people that experience them (Bendix, 1999). Putting the commodification of this pseudo vernacular architecture for touristic consumerism aside, as we prevalently saw in the 1980s, the case in Akyaka shows us that this invented architectural tradition became what is authentic for Akyaka for the people living there.

Being debatable in terms of its authenticity, this unique architectural language nevertheless brought with it a sensitivity towards the cultural and environmental assets of the town. In 2011, with the guidance of the mayor then, it applied for and took the title of ‘slow city’ (*cittaslow*) from the Cittaslow Organization on the basis of its unique architectural language, sensitivity towards natural and cultural values, and its environmentally friendly, sustainable development, which values the wellbeing of its inhabitants (Cittaslow Akyaka, n.d). The *cittaslow* movement, celebrates the unique, local characteristics of cities against the homogenization and standardization created by globalization; it values the protection of the cultural and natural values of cities; and supports sustainable, local development that considers the wellbeing of the inhabitants and the nature (Sengur and Atabeyoglu, 2018; Cittaslow International, n.d). Akyaka, both in terms of its municipality and its citizens, is very much aware of the importance of these values for its future and consciously protects them against pressures coming from outside for touristic development. It protects not only its architectural unity but also its sustainable development by using renewable energy resources, developing nature-friendly alternative tourism practices, and local production (Cittaslow Akyaka, n.d).

When evaluated according to the goals of sustainable development in this sense, which were specified by the United Nations in 2015, it is seen that in terms of the seventeen sustainable development goals, which were declared as no poverty, zero hunger, good health and wellbeing, quality education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequality, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice, and strong institutions, and partnerships for the goals (United Nations, 2015; United Nations, n.d), the town of Akyaka is in the track of sustainable development to a large extent. The town attempts to keep these criteria, for the wellbeing of its inhabitants and nature, for maintaining sustainable tourism practices that economically support them, and for keeping their town's title as 'slow-city' for the future generations. On this basis, due to its specific architectural character that depends essentially on cultural and ecological values, the town inadvertently works for its sustainability.

4. Conclusion

This developmental process is an example where one work of a single designer changes the whole outlook of a context towards a better, more sustainable future. By means of its visual, cultural, and environmental sensitivity, Cakirhan house not only created the architectural language of the whole town of Akyaka, but it also inspired the town towards sustainable development that values its natural and cultural assets and the wellbeing of its inhabitants. Of course, the architectural language of Akyaka can be found debatable in terms of its authenticity; for a visitor might be mistaken, thinking that those buildings belong to much earlier times and that they are the products of a natural process of cultural formation. Nevertheless, when the architectural, sociocultural and environmental effects of the practice is considered, the outcome is still valuable in terms of exemplifying how an architectural practice can result in the development of a sustainable and harmonious architectural environment today.

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Using evaluation tools in urban regeneration processes

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Abstract

A large number of cities are plagued by problems of urban decay that affect their livability and reduce their wealth. Actions of urban regeneration can contribute to solve such problems and turn cities more attractive for living, qualifying activities, tourism, and investments. However, the processes of urban regeneration are highly complex: they impact at the same time on territory, community, and environment; they imply the establishment of public-private partnerships and of inclusive governance structures; they provide for the delegation of powers to entities autonomous, durable and hopefully disengaged from the political context. This study, starting from the study of phases of urban regeneration processes, focuses on models and evaluation tools that can contribute to troubleshoot the decision-making clues within the various phases and sub-phases of the regeneration process, supporting its entire decision-making process.

Keywords

urban regeneration, decision tools, governance, public-private partnership, evaluation

1. Introduction and aim of the work

According to the World Bank, urban decay weakens the city's appeal, reduce its livability and wealth. Regeneration processes, from urban to building level, can effectively counter such trend by putting cities in a new dimension as far as livability, qualifying activities, tourism and investments are concerned.
Since problems of urban decay are widespread all over the world, urban (and building) regeneration is a challenge of international interest and in the last 3 decades has aroused increasing interest; the European Union holds urban regeneration as a fundamental tool to achieve energy independence and curb land consumption (European Commission, 2019; 2020; Eurostat, 2019).
However, a regeneration process, especially at urban scale, is highly complex as it jointly impacts on the three basic assets on which human life depends: territory, community, and environment. It requires coordination and collaboration between the public and private sectors, wide availability of credit, community participation in the governance structure (Bertoldi et al., 2021).
Redevelopment actions that aim to achieve virtuous results, have to pass the phases in which a regeneration process is structured: scoping, planning, financing, and implementation (World Bank).
The complexity of such urban regeneration processes suggests the usefulness of models and evaluation tools that, ex-ante and in itinere, support decisions and ensure the proper functioning of the governance structure. Ex post, the support of models and evaluation tools can help in monitoring the effects of the regeneration process.
Each phase of the regeneration process can be associated with evaluation tools that can help maximize the effectiveness and results to be achieved (Paetz et al., 2007).
Scientific literature provides a large number of assessment models and tools, of which some are tested at scientific and operational level, that can effectively support the regeneration process. Among these: i) techniques for decision support: methods and techniques of real estate valuation (Battisti et al., 2017), cost-revenue analysis, discounted cash-flow analysis (Bezemer, 2012), cost-volume-profit analysis, cost-benefit analysis (Layard et al., 1994), multi-criteria analysis (Ishizaka et Nemery, 2013), scenarios creation methodology (Makridakis et al., 1998), life-cycle assessment, feasibility studies, risk analysis, logical framework, SWOT analysis; statistical models of linear and multiple regression; ii) techniques for

the management of governance structures (Battisti et Guarini, 2014): check-list, key-person interviews, stakeholder analysis survey, questionnaire survey, Group interview, Focus group survey, Event (symposium, onsite observation meeting, fair), mailing list, corporate identity formulation, briefing open hearing, open house, workshops/charrettes, task force, public relations documents (brochures, fact sheets, public relations papers), hotlines, comment cards.
The goal of this paper is to identify the possible evaluation challenges related to each procedural phase (and sub-phase) of an urban regeneration initiative, coupling them with possible models and tools that may solve the related evaluation question, thus supporting decisions.
In this way, we intend to get to a taxonomic synthesis of the evaluation and decision support tools that can be used in urban regeneration processes, integrating the indications of the World Bank with additional cognitive elements derived from the research activity.

2. Stages of the regeneration process and tools that can be used

In each of the four phases highlighted, a good evaluation can be the key to the success of the regeneration initiative.
First of all, the initiative must always be clearly outlined to all stakeholders and each phase must be organized into several manageable components; the ultimate goal, that all regeneration processes share, is to manage a the complex series of interdependencies between public works (punctual and infrastructural) and private works; public interventions on transport services, protection of open spaces, reclamation of abandoned areas, must be associated with the planning of private interventions aimed at respecting the "genius loci".
The scoping phase is focused on analyzing the context and setting the intervention logic or the guiding narrative of the regeneration initiative. In this phase, the vision and expected long-term effects must be outlined by foreshadowing the inevitable changes that regeneration entails and the possible variables of the market and political cycles.
During this phase scenarios creation methodology, feasibility studies, logical framework and SWOT analysis can contribute in the definition of regeneration process allowing to prefigure possible solutions and the related effects.
In the subsequent planning phase, all policy actions and administrative procedures must be put in place to make the regeneration process operational. Regulations are used both to attract private capital and to leverage the community by boosting private participation. The involvement of private capital and the model of governance structure may depend on the institutional political context of the area, the policies pursued, and the regulatory tools that can be used.
In this phase, appraisal related to the real estate takes on particular relevance. Methods and techniques of real estate valuation, cost-revenue analysis, discounted cash-flow analysis, cost-volume-profit analysis, cost-benefit analysis can be useful to assess the values of regeneration process. It is also fundamental for the composition of the “operational structure” that will implement the initiative in the case of public-private partnerships. The cost-benefit analysis can from this stage allow the choice between several solutions on the basis of the balance between negative and positive externalities, not only financial but also in socio-economic terms of the initiative.
The funding phase is crucial to the success of a regeneration initiative. Generally speaking, the management of a regeneration initiative – as a public, private, or public-private partnership - affects the types of financing tools that its lead sponsor may access. The greater the regeneration initiative, the greater its complexity, and the higher are the resources needed for successful planning and implementation. The World Bank looks at partnership with the private sector as the preferred operational mode not only for cost-sharing but also for sharing risks and technical capacity. Besides, the use of public-private partnerships does not exclude the possibility of combining internal and external sources of funding, policy and regulatory instruments, and strategic partnerships.
Statistical models of linear and multiple regression can allow to check the stability of financial operation if one or more variables change. These techniques could also be used to implement sensitivity analysis useful for investors. Risk analysis can effectively contribute to identify the nature of the operation and the risks associated with it, as well as deduce the most appropriate return on investments.
In the implementation phase, the regeneration plan/program is carried out; the vision of change

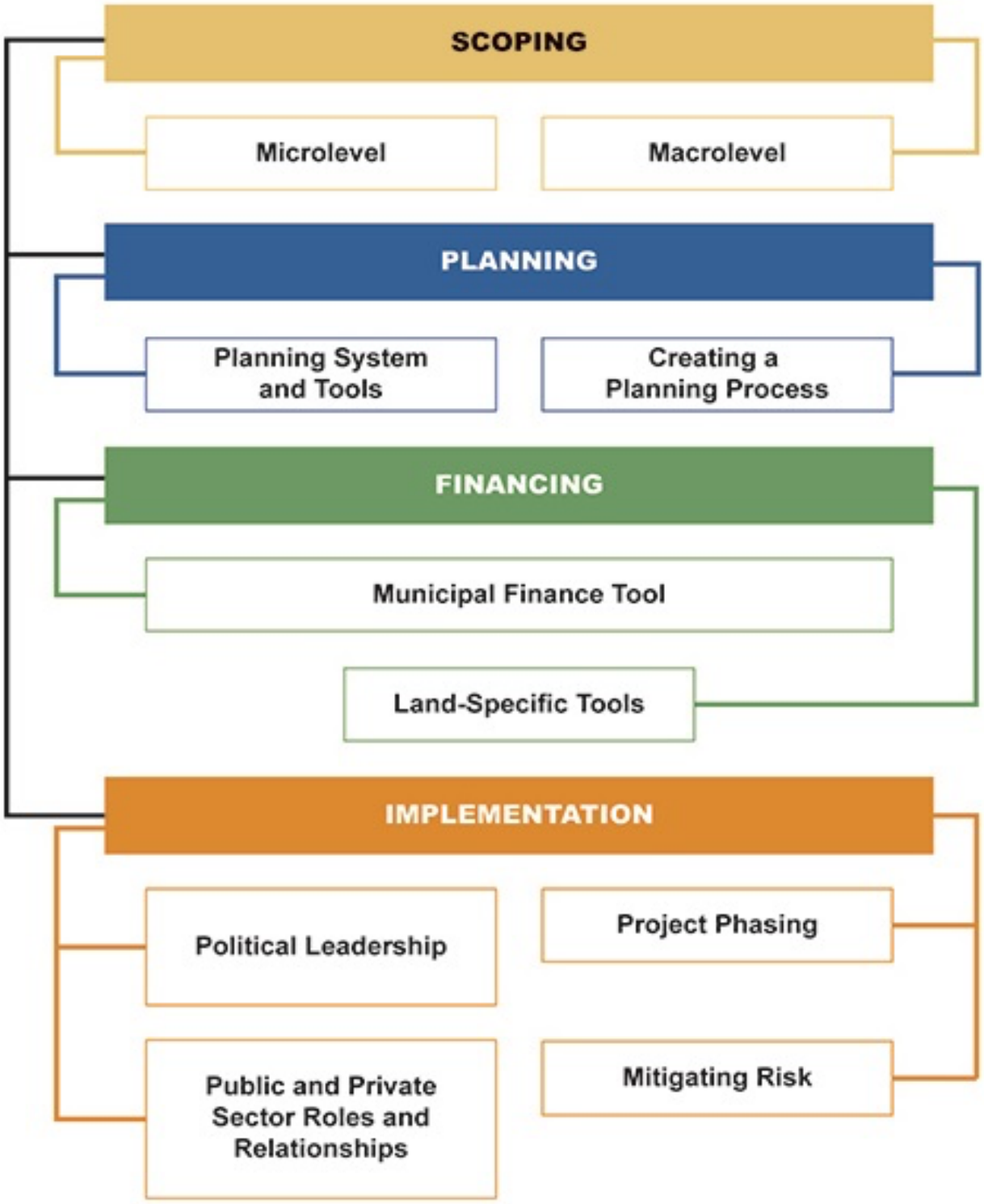

Fig 1. Regeneration process (source: https://urban-regeneration.worldbank.org/)

foreshadowed in the previous phases must be accomplished, checking the match between expected results and achieved results. This phase implies the creation of a solid and sustainable organizational structure that can endure over time even under several political administrations. The leadership of the regeneration initiative can be a key element for its success.

The institutional structure of the government of the initiative, preferably autonomous, must have the power and the tools to be able to ensure its operation. A regeneration initiative is a long-term process of change that involves significant transformations in the territory, with significant effects and risks; an autonomous, lasting, and solid leadership is essential to manage the process of change in such a way that all stakeholders feel involved, understand its importance for the future of the city and have genuine opportunities to contribute actively. The additional goal expected in the implementation phase, beyond achieving the goals of the plan/program, is greater community cohesion.
In this phase, e.g., life cycle assessments can foreshadow the life of the building regenerated during their life.
There are also some evaluation techniques that can be usable at every stage of the regeneration process. The Multi-Criteria Decision Analysis can effectively be used ex ante, in itinere and ex post; it lends to a use since the preliminary phases of programming of the regeneration process in order to evaluate the proposal against certain criteria (and related indicators) closely interconnected to the objectives to be achieved. The same applies to the techniques for the management of governance structures; in every phase where there is an interrelation of actors and stakeholders, dialogue can be facilitated by the use, according to specific needs, of one or more of the mentioned tools.

3. Further developments of the study

This contribution has only intended to focus on a topic that is still not particularly widespread in the literature: the selection of the most appropriate evaluation tool in a specific phase of a decision-making process (in this case regeneration). Further developments of this study, aimed at defining a taxonomic synthesis of the evaluation and decision support tools that can be used in urban regeneration processes, in addition to increasing the number of techniques under study, may concern the analysis of the various techniques mentioned in this study in relation to the various stages of which the process of urban regeneration is composed, also using the SWOT analysis, for each possible technique, usable in a particular procedural step.

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Unesco heritage and spatial analysis in a GIS environment.

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Abstract

The article presents the analysis of the urbanised context of the Portuguese city of Sintra carried out with the help of a GIS (Geo-graphic Information System) platform. The accurate process of collection, analysis and knowledge of data characterizing the Site through this tool has made possible the creation of thematic maps populated with qualitative and quantitative information, allowing a dynamic and integral knowledge of the territory. These documents give users the possibility of accessing not only a virtual image of the urban fabric, but also a complex and questionable one, which can be manipulated and analysed according to their own preferences. Prolonged application of this survey method over time makes it possible to identify changes in the real estate market, with the possibility of correlating this data with any phenomenon or aspect of the territory through digital graphic images.

Keywords

Property market, GIS, maps, Sintra, UNESCO.

1. Introduction

Innovation in information representation and communication systems is today oriented towards the search for models of digitisation, archiving and dissemination of data, in order to obtain an integrated knowledge of the territory aimed not only at its management, but also at multimedia and multidimensional use. These circumstances have led to the use of GIS (Geographic Information System) applications in hitherto unexplored fields. The GIS, born from the need to provide public and private users with a decision support tool to solve complex problems of spatial analysis, is built through a process that begins with the acquisition of data from different sources, proceeds with the insertion of these in a database and ends with the presentation of the results obtained. GIS thus provides a critical methodology for the collection, representation, understanding, management and communication of the various aspects of the physical and anthropogenic environment of a territory (Caiaffa, 2002). It also offers the opportunity to manipulate large amounts of geographical information thus revealing important aspects of issues that would have remained hidden in a non-dynamic form of geographical representation. The end result is the creation of thematic digital maps, made up of several layers that can be superimposed on cartographic bases or satellite photos, through which it is possible to capture, analyse and resolve critical situations of an environmental, social, economic, anthropic nature, etc.
The intuitive management and immediacy of use of such GIS systems has led to a rapid increase in fields of application, including the real estate and construction sector, given the obvious link between real estate data and the urban fabric. Information systems technology is therefore a tool for defining and outlining the scenario and trends of this market, contributing to the transparency of the sector within an urbanised context. The estimation literature has long highlighted
the importance of acquiring real estate data in order to make them easily available to those interested in the dynamics of the real estate market (Salvo, Aragona, 2006).

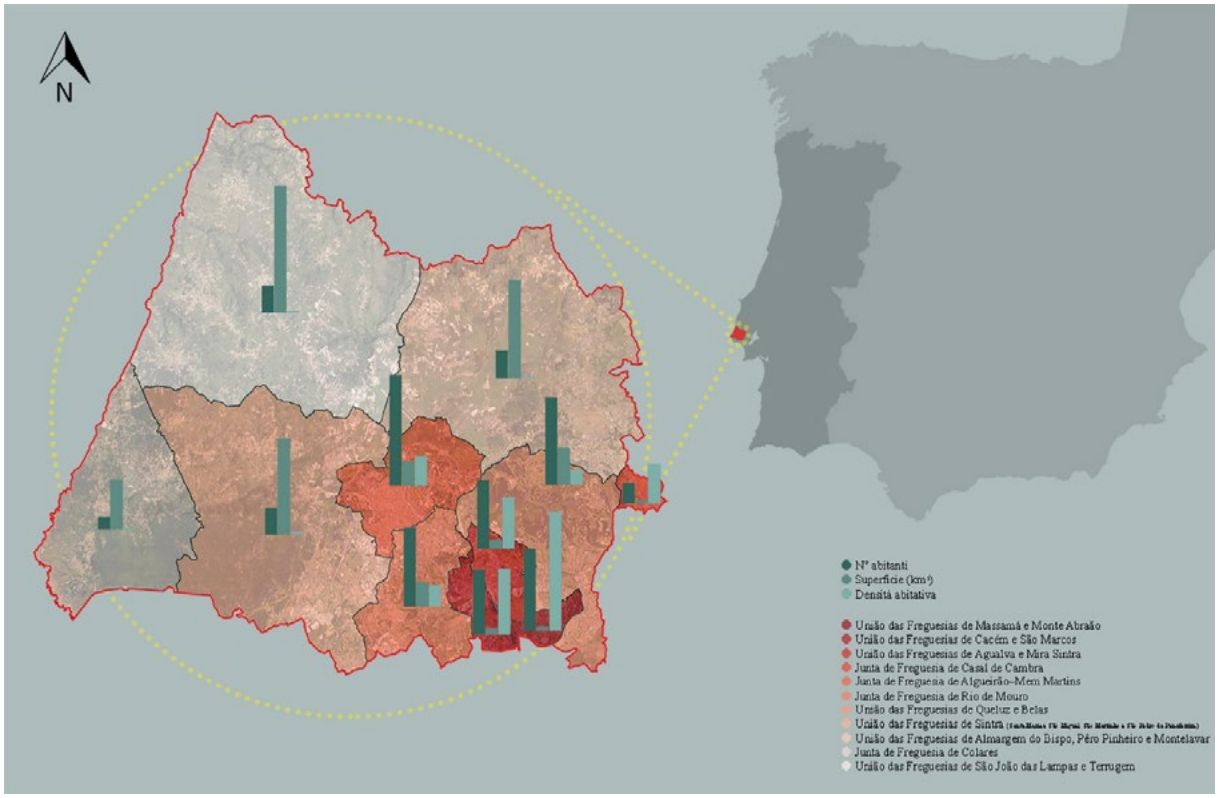

Fig 1. Breakdown of the territory into the eleven freguesias and analysis of their characteristics (number of inhabitants, surface area, population density). (Fabiana Guerriero, 2021).

2. International research

Portugal is a country with a rich cultural heritage of great architectural, historical and artistic value. Among the beauties of Portugal is the city of Sintra, recognised in 1995 by UNESCO as a cultural landscape for its unique symbiosis of nature and man. Located at the foot of the Serra of the same name, just 30 km from the capital, Sintra occupies an important place in the Lisbon district both in terms of its geographical size (319 km2) and number of inhabitants (377,835). The city, which is part of the Sintra-Cascais Natural Park for approximately 35% of its surface area, is administratively divided into eleven freguesias (the smallest administrative division in Portugal), seven of which are classified as urban, with a population density greater than 500 inhabitants/km², and four as semi-urban, with a population density greater than 100 inhabitants/km [fig. 1].
According to a study carried out by the Strategic Development Division of CMS, 10% of the building fabric is characterised by buildings constructed up to the mid-20th century, 80% by buildings constructed since the 1960s and the remaining 10% by buildings from the last 20 years. It also shows that 69% of the properties are residential buildings. As is well known, as early as the end of the 19th century, the court's summer stays in Sintra attracted the attention of the Portuguese bourgeoisie, leading to the construction of a significant number of residences and quintas. Infrastructural improvements, in particular the construction of the railway line, then produced a significant increase in population and the consequent construction of new buildings for residential use. The observation of this segment of the real estate market, resulting in the creation of digital maps with the aid of GIS software, therefore allows for a more in-depth knowledge of the territorial reality, also providing those interested in investing with useful information about the Portuguese city. With this in mind, the study started with a preliminary urban analysis of both the local infrastructure and the main attractors, which influence the supply and demand of the residential market [fig. 2] (Grella, 2006). The two main axes of communication, road and rail, allow easy and fast connections with neighbouring cities; the municipality's school network is well

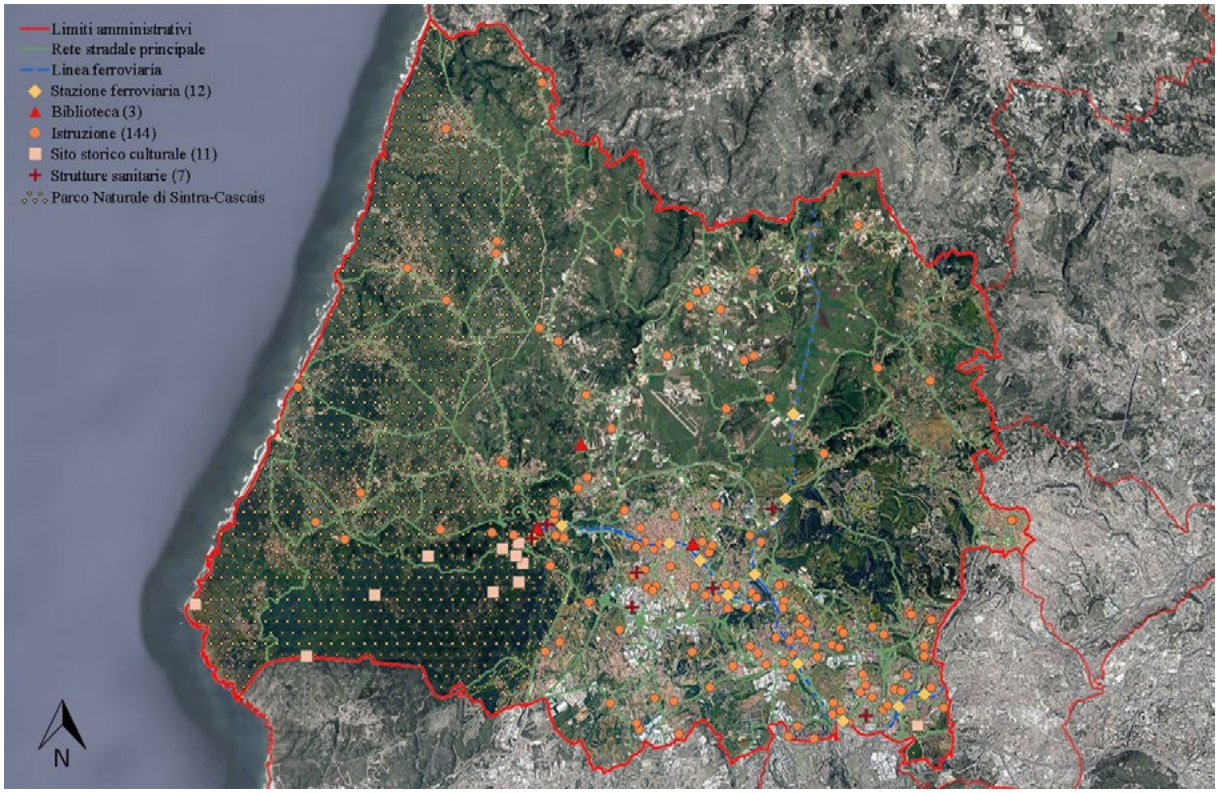

Fig 2. Urban planning analysis through geocoding of the infrastructural endowment and the main attractors (QGIS software; SR: WGS 84 / Pseudo - Marcator). (Fabiana Guerriero, 2021).

distributed throughout the territory and offers a wide range of education; the numerous and exuberant cultural and landscape attractions constitute a strong tourist attraction, contributing to increase the employment rate in several sectors (hotels, restaurants, shops, transport, etc.).

The survey then continued with an analysis of the needs of possible buyers through surveys. It is known, in fact, that the use of housing stock is often the result of personal strategies capable of influencing the mechanisms of choice and preference of those active in market demand (Curto, Coscia, Fregonara, Grella, 2008). This study has also shown how the passage of the pandemic has reshaped the idea of home. In recent years, the time spent at home has increased exponentially, making it the centre of all daily activities. Everyone has started to value 'having space' and has reflected this need in their search process. Users prefer a home with larger, brighter, more comfortable and versatile interiors that allow for a better quality of family life, home office spaces that facilitate smart working and a contiguity with the outdoors in the form of balconies, terraces or gardens. The desire for peaceful environments with greater contact with nature has conditioned the search for homes located in rural areas or on the beach, recording an increase of 35%. The use of the GIS platform allowed, in the next phase of work, an effective exploration of the local residential offer. At the basis of this analysis was the construction of a computerised database, which made it possible to draw up an initial profile of the main qualitative characteristics of the properties on the market (Marchi, Argiolas, 2005). Therefore, for each real estate unit examined, information was collected on price, location, exposure, dimensions, equipment, level of finish, any technical devices, state of conservation and maintenance.

The geocoding operation then allowed the immediate identification of the offer ads analysed on the satellite image of the Portuguese city and the consequent display of all the real estate information, with a considerable gain in terms of time and efficiency (Borruso, 2008). On the basis of the aforementioned characteristics of the database, it was possible to create several maps classifying the information according to different themes [fig. 3] capable of providing new content with reference to the multiple territorial peculiarities.

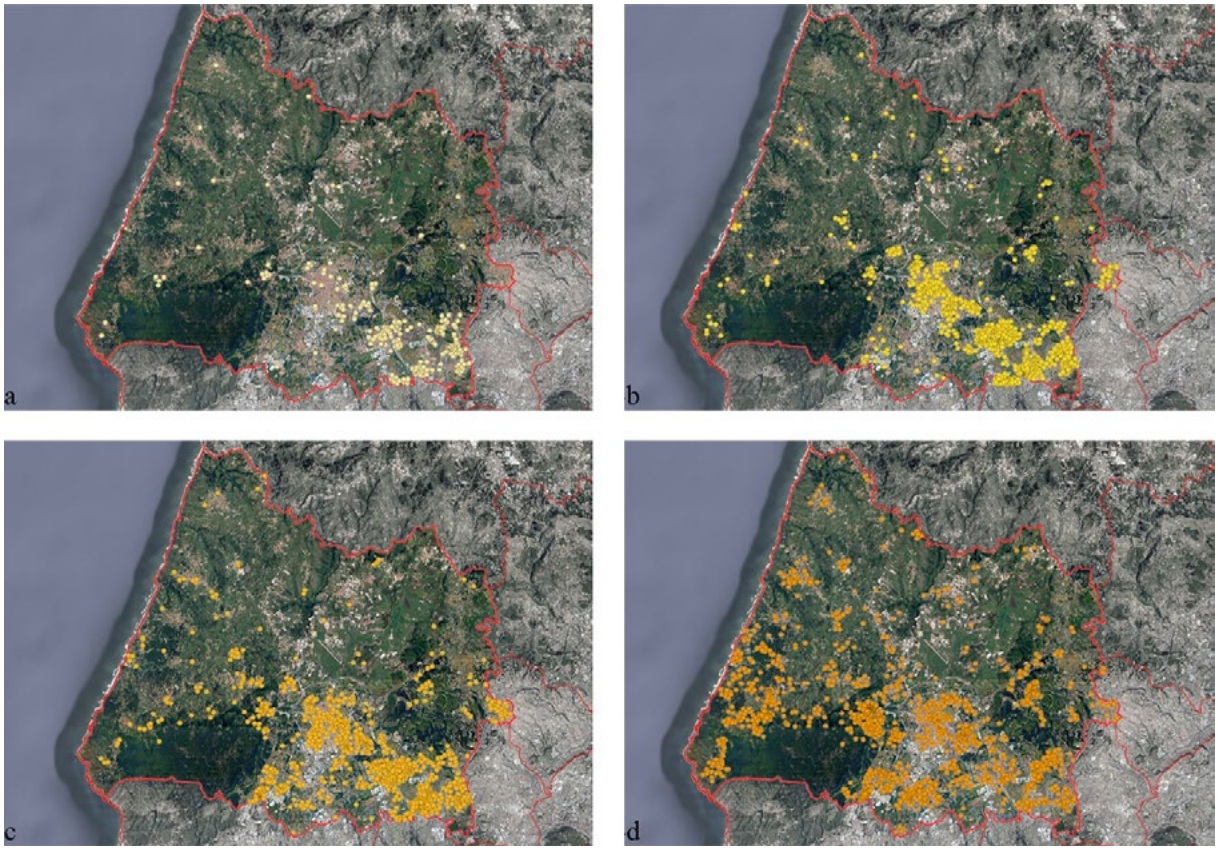

Fig 3. Geocoding of local properties according to the number of bedrooms: a 1-bedroom, b 2-bedroom, c 3-bedroom, d 4-bedroom (QGIS software; SR: WGS 84 / Pseudo - Marcator). (Fabiana Guerriero, 2021).

The outputs obtained in this way made it possible to achieve the objectives of the survey on the residential property market as regards the aspects relating to the description and interpretation of the market itself. They can also be exported as interactive and intelligent multimedia contents within web pages, portals, etc., thus providing a powerful and effective aid to communication and dissemination. From this point of view, the research carried out provides a necessary basis for the study and processing of the real estate market in the city of Sintra, thus contributing to the transparency of this market for different types of users (Mollica, Massimo, 2003).

8. Conclusion

The work offered the possibility of learning about and disseminating the characteristics of the Portuguese site, through the use of GIS software. The latter, intended as a tool for the collection, analysis and visual presentation of data relating to the urban fabric examined, has allowed the elaboration of maps rich in information that can always be integrated and implemented. In this perspective, it is the user who plays an active role by choosing, according to his preferences or interests, which forms of data to access (Kraak, Brown, 2001). Moreover, a continuous application over time makes it potentially possible to quantify and localise changes in property values, offering the possibility of correlating them with any phenomenon or aspect of the territory. This representative and communicative model may become the prototype of a method to be applied in similar contexts to carry out increasingly accurate and dynamic thematic surveys, allowing the flow and circulation of information.

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12 Design for Sustainable & Safe Communities

Slowork, room with view.
Behaviors, Heritage, Design for new lifestyles

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Abstract

Starting from the interpretation of historic villages as models of sustainable open communities and social innovation capable of encouraging interaction between people and areas at multiple levels, and from the importance acquired by the psychological and sociological benefits deriving from the prolonged stay in these contexts, the research intends to provide an example of environmental design focused on the processes of behavioral change implemented by tourist behavior when it enters into a relationship with cultural heritage at different scales, from the architectural one to the single design artifact, without necessarily giving up one's own working needs through multisensory enjoyment.
The paper describes the eco-design process for the construction of temporary rooms for SLOWORK that can be placed inside the main tourist attractions and in external symbolic places, such as central squares and possible viewpoints. The temporary rooms will contain sustainable materials and renewable energy solutions determined by the particular seasonal climatic conditions.

Keywords

Slowork, climate, energy, ecodesign, cultural heritage

1. Introduction

If art and nature can arouse a feeling of joyful wonder in the mind of the observer, living and even more so having the opportunity to work in them can improve our existence. The spontaneous attraction that can arise between the subject and the cultural asset places aesthetic and ethical feelings in close relation to each other. A renewed agreement between us and the world that affirms the centrality of beauty capable of expressing itself in us and in our actions. Slowork was born from these premises. Starting from the relational value, characteristic of historical contexts as well as of cultural spaces, the research project focused on the concepts of well-being and harmony deriving from the combined use of smart working technologies with the multisensory enjoyment of cultural heritage at different scales - from architecture to the single design artefact. Within the contemporary scenario, the processes implemented by tourist behaviour place the visitor in relation to the cultural heritage, associating traditional use with a plurality of services that favour changing working needs, starting from the interpretation of historical villages as open systems suitable for favouring interaction between different subjects at multiple levels, and from the importance acquired by the psychological and sociological benefits deriving from a prolonged stay in such contexts. This gave rise to the idea of creating temporary rooms for smart working that could be located both inside the main tourist attractions, museums, convent complexes, historic buildings and in symbolic outdoor locations, i.e. central squares and any belvederes. The tourist, in effect a temporary inhabitant, is enabled to stay in the contexts traditionally dedicated to short visits, favouring work performance with the aid of smart co-working stations. By means of an assisted stay pact, he or she has access to tourism promotion services and smart working services, with progressive and continuous experiential involvement. Similarly, the citizen, beyond the domestic threshold, has the possibility of accessing a wide range of additional services in the places of choice in his or her

Fig 1. Slogan-words of the Project

municipality, with new possibilities for interaction and exchange and in the full guarantee of professional standards linked to the de-materialisation of work. The rooms, designed, built and managed according to the circular economy model and within the framework of objectives to reduce energy consumption, arise from the study of alternative and renewable energy solutions based on climate and environmental surveys, with particular attention to the use and inclusion of people with physical, cultural and cognitive disabilities. At the basis of the design process that guided the project are the key words captured by the team in the meanings of responsibility, reproducibility, symbiosis, need, multidisciplinarity, resilience, creation, polyhedral. An ideal synthesis of the entire process, starting from the sense of responsibility, understood as the possibility of foreseeing in advance the consequences of one's own behaviour and, if necessary, correcting it based on these predictions, to arrive at the multifaceted nature of beauty, of nature, of life, of art, of history.

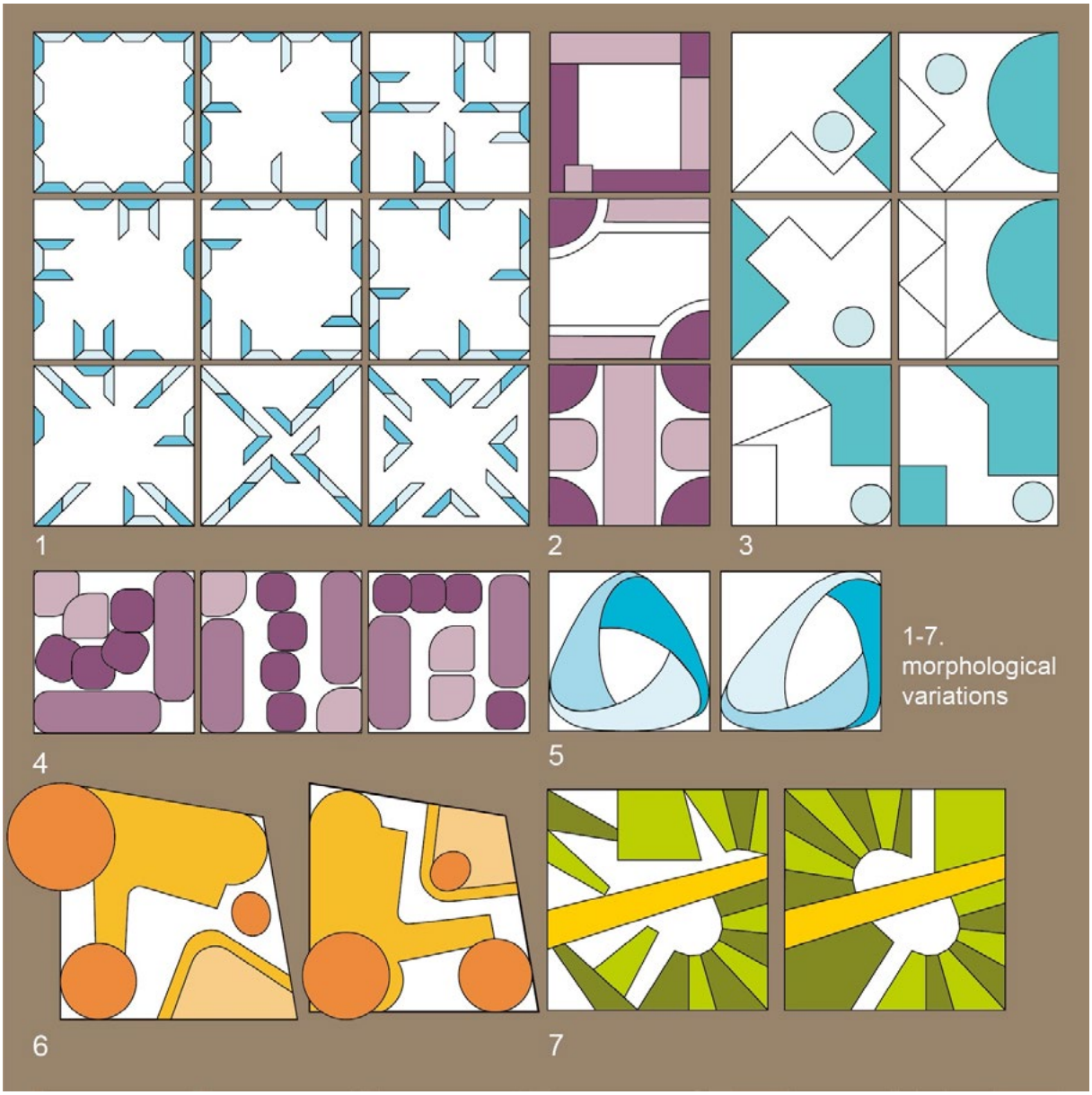

Fig 2. Morphological variations of the room

2. Behaviors_for a slow lifestyle

Villages emptying has significant economic, social and cultural consequences: their disappearance involves the loss of historical memory and the abandonment of a territory full of productive and artisanal potential. The epidemiological emergency from COVID-19 highlighted the phenomenon of depopulation that has characterized small Italian municipalities for over a decade, accompanied by the aging of the population and the scarcity of job opportunities, with the consequent thinning of the supply of services essential. The possibility of a reversal of the trend must not only be grasped, but made structural, thinking of a rebirth model for small municipalities and as proposed and envisaged in the law proposal No. 2316 "Delegation to the Government for the promotion of agile work in small municipalities" aimed at communities with less than 5,000 inhabitants, which represent over 70 percent of the nearly 9,000 Italian municipalities, with a population of 11 million citizens. The national strategy for inland areas,

conceived and launched a decade ago, precisely to counter marginalization and decline, now can find an additional strength in agile working (smart working). The slowork, room with view project aims to design a temporary structure using sustainable materials, renewable sources to accommodate six workers/students in some Umbrian villages with the possibility of working/studying in smart working, promoting an alternative lifestyle to the metropolitan ones, favoring the development of innovative economic and social models capable of combining tradition and modernity, triggering a real rebirth of the territory by favoring the construction of an environment on a human scale.

3. The urban areas of Umbria

In the last twenty years, design processes and good practices oriented in an ecological sense have progressively taken shape. This is the case, for example, of the biomimicry of Janine Benyus aimed at projects of structures and processes inspired by nature, but also of the implementation of sustainable circular systems, where artifacts and waste are perceived and treated as fruitful resources, through the whole design, production, reuse or recycling chain. Individuals and communities have acquired an environmental awareness and a part of contemporary design culture has long understood the importance of a now essential "eco-design", which knows how to act in a multiscalar and transversal way, definitively changing the anthropocentric perspective into a new perspective ecocentric holistic. The investigations were carried out in the main squares of the eight municipalities selected and responding to the need for revitalization: Trevi, Spello, Foligno, Bettona, Bevagna, Deruta, Montefalco and Bastia Umbra. The analyzes related to the relationship between urban space and the landscape are typological, morphological, sensorial, with particular attention to the theme of urban furniture. The room has a temporary nature that can be counted as one of the artifacts of urban supplies for the revitalization of the historic center, the mediation between environmental and functional needs and the connection between contemporary needs, history, memory and culture.
The purpose of the townscape, wrote Gordon Cullen, is to take into consideration all the elements that combine to create the environment: buildings, trees, nature, water, traffic, advertisements and so on and weave them together, in order to create the drama (the city), through the dichotomous components: exposure, inclosure; hereness, there. ness; here, there; close, open; recession, projection; in out; and through the divisions and sequences of space: continuity, thisness, urbanity, lettering, wallscape, floors cape. All the elements that are part of the small centers, objects, facades, greenery, are examined through three categories: optics, place, content. In a qualified intervention, Giovanni Klaus Koenig tackles the theme of street furniture, on the other hand, in semiotic terms, stating that towns are emitters of cultural signals, therefore they must communicate a series of information. The project intends to place an "ecological" heart (the room) within the consolidated urban heart (the square) in order to trigger an osmotic process that goes from small to large and vice versa. Designing in these ways within a centuries-old spatial context requires a radical change in the thinking and attitude of the designer, who, reflecting on the characters and dynamics of nature, must offer an increasingly sensitive and convinced contribution to change non-logical sustainable still mostly recurring. “Slowork, room with view” designs a "notebook of morphologies" by elaborating an interpretative model that identifies different models, starting from the study of the connective tissue, of the characters and compositional solutions, of the evident and/or hidden forms. They can be traced from the participatory sketch, from the measurement, from the photography of natural places and buildings, a chain of knowledge and interest in territorial issues up to the design of details, systems, technologies, materials with functional shapes and parts at the service of small compliant buildings, contemporary and recognizable, also and above all suitable for an important communicative role. “Slowork, room with view” is connected to biophilic design, a discipline that frames nature as a regenerative tool, capable of satisfying the psycho-physical well-being of man when in contact with nature. A regenerative environment is such if it satisfies the five senses through thermal comfort, regenerating light and natural light, olfactory and neurological perception. Renewable sources become in this sense congenial tools for the design of highly technological envelopes that at the same time live with respect to the methods and times of nature. It is therefore possible, using the climatic analyzes elaborated by the Copernicus platform, to use renewable sources in the best way in the different topological configurations of the rooms for the slowork. Natural ventilation allow the achievement of the right level of healthiness of the internal environments, avoiding condensation and reducing the concentration of pollutants, using air exchanges that are naturally triggered between

Fig 3. Renewable energy solutions

internal and external environments, due to differences in temperature and pressure. It can be used in a mini-wind system capable of using the energy of the wind and converting it into electricity for domestic use, a tree-shaped system, consisting of rotating leaves that follow a 360-degree movement. The first leaves are positioned three meters above the ground and overall there are at least 100 plastic leaves on small generators. The wind therefore allows the latter to act as turbines. The wind tree captures the wind regardless of its direction, favoring the storage of pure energy, using air currents and vertices. Another interesting system to be placed within the small spaces for the slowork is the turbine wall, a system consisting of small vertical axis wind turbines that can be structurally integrated into the built environment. This kinetic wall is made up of a series of rotating blades that rotate individually, activating a small generator that creates electricity, capable of capturing the wind from all directions. The purpose of the wind turbine wall is to put together a series of silent kinetic walls through which to obtain hypnotic visual effects. The roofs of the rooms are characterized by the best-known voltaic systems, which use

visual effects. The roofs of the rooms are characterized by the best-known voltaic systems, which use solar energy to produce electricity through the photoelectric effect and the use of materials sensitive to sunlight. All typological solutions provide systems for the collection in suitable tanks of rainwater, through chimney collectors and gutters.

4. Conclusion

The project of the room with a view, used in the description as a space of slow work, or slow work, to be inserted in the center of the small villages to be revitalized, can also be declined in other functional modes. In particular, the small energy-self-sufficient space, built with ecological materials, can be used for temporary exhibitions, as a hobby or as a great communicative beacon of the resources of that particular urban place.

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Living Hub: setting up a living lab for Simulation based Design activities

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Abstract

As the world population grows older and the exceptional event of the Covid-19 pandemic radically modified our habits, the theme of wellbeing within the domestic environment is gaining importance in the design scope. To provide effective solutions for allowing fragile or elderly users to maintain independence at home, designers need to be able to investigate people's lifestyles to empathize with their needs. High fidelity simulation – a method frequently used in the sanitary field for education purposes – allows to obtain precise data and useful insights that would not be acquired through traditional User Research methods. To leverage this potential, a simulated home environment must be set up, where to conduct research activities and experiments. The article describes the design process of Living Hub, a 74 mq living lab that simulates a domestic apartment, equipped of audio/visual recording tools and sensors. The modular setting allows to create several scenarios to study inclusive solutions for every user target.

Keywords

Simulation based, design for all, human technology interaction, human centered design, living lab

1. Introduction [FB]

Due to the Covid-19 pandemic spread in 2020, the world population was forced indoors and had to radically readjust its habits, spending more time at home – especially in the kitchen – to rediscover traditional cultural factors, such as baking, but also finding ways to exercise without dedicated gym tools and making a wider use of online services such as e-commerce and home delivery (Corvo and Fontefrancesco, 2021). The pandemic has enhanced the relationship between people and technology, increasing the time spent online to work and engage in social activities. Complex systems that run machines using Internet of Things (IoT) gained more relevance, even though they have been in use since the end of the 20th century (Ashton, 2009). Today, IoT is a widespread network of connected devices that surrounds us and facilitates most of our everyday activities; Khanna and Khanna (2013) describe this scenario as the Hybrid Age, in which human evolution is strictly tied to a technology that is omnipresent, smart, and social.

Within such context, human factors represent a fundamental perspective for technological innovation and development that significantly affects the success and adoption of technical products and services (Hancock, 1996). The research field defined as Human-Technology Interaction (HTI) aims to describe and optimize the activity of a cooperative system that users and technology form together with their physical and social environment (Norros et al., 2003). Such relation is not easy to design, as engineers and designers struggle to understand the challenges that their users face, as the latter's Technology Quotient (TQ) is considerably low (Subrahmanian et al., 2020). In this context, the renowned approach of Human Centered Design defines a discipline, as well as an ISO standard, for which design must be based on the study of human needs (Norman, 2013). Such approach enables researchers and designers to empathize with their users and even leverage their knowledge on matters of their everyday

life, through a variety of methods and practices that may often be updated and adapted to the specific theme that is being studied (Sanders et al., 2008).

2. Simulation based Design [IN]

The term simulation comes from Latin's *simulatio* and means to make similar. Therefore, when we are simulating, we are trying to reproduce and represent an object, a situation, an environment (Aliner, 2011). Using such technique, we may substitute or even amplify natural experiences by evoking or replicating substantial aspects of real-life situations in an interactive way (Gaba, 2004). Simulation has a consolidated history, beginning in the military field, and it is a popular approach for education in scientific scopes (Siri et al., 2017). Reasonably, simulations may present a various degree of fidelity to real-life situations and may require a various number of technological instruments or human interpreters to be carried out (Gaba, 2004).
The advantages of such technique within a HCD design process are multiple: it is evident that practical limitations often prevent to carry out structured and prolonged studies in users' private houses and workplaces. This obstacle may be overcome by reproducing such conditions in simulated spaces. In addition to this, researchers may propose the use of innovative technologies within contexts that differ from those where people currently live. Such practice could lead to discover how people would behave in a different situation (Timmeren e Keyson, 2017). In fact, the creative activity of design is based on the correct interpretation of a complexity of changing factors, to lead to innovative solutions that may go as far as to proposing new lifestyles (Tosi, 2018).
It must be noted that a simulation may not completely reproduce a natural environment, but previous experiences show that living laboratories (LL) stand as a valid compromise between in-situ and laboratory research (Intille et al., 2006). Although collecting data in a place that is not the real user's home will alter some behaviors, a high-fidelity simulation allows for relatively natural ethnographic observation and data collection on daily activities such as cooking, socializing, sleeping, cleaning, working. Having made such considerations, the initial effort required to design a simulation laboratory for design practices is fully repaid by the range of opportunities that it generates.

3. How to set a up a living lab: the Living Hub case [AV]

The Living Hub concept originates from the encounter between the design research team of DAD (Architecture and Design department) and SimAv (Service Centre for Advanced Simulation and Training) of the University of Genoa, Italy. SimAv is devoted to organizing and coordinating research and education activities that leverage the potential of simulation within the sanitary scope. Living Hub represents a physical and disciplinary extension of the latter, which therefore opens its activities to professionals who aim to produce Human Centered Design (HCD) solutions for their users. The laboratory aspires to become a reference space for researchers, companies and active citizenship, by allowing to experiment innovative assistive solutions for the domestic environment, thus improving IoT and social technologies that allow fragile users to maintain autonomy and independence.
The objectives of the laboratory are manifold:

- to study users' needs in a simulated domestic environment;
- to collect data on users' interaction with existing technologies or innovative prototypes;
- to organize co-design activities with users and stakeholders to generate new solutions;
- to train formal and informal caregivers, as well as other professionals, to use assistive technologies in domestic environments;
- to educate designers and students on inclusivity matters by simulating real-life scenarios.

Such goals are coherent with the principles of HCD approach and Living Lab (LL) approach, which has been developed at MIT by Prof. William Mitchell (Følstad, 2009). According to the European Commission definition (2009), Living Labs are user-centred, open innovation ecosystems based on systematic user co-creation approach, integrating research and innovation processes in real-life communities and settings. By adding simulation to this equation, the Living Hub will prove useful in every stage of the design process, by:

- allowing for in-depth research activities during the exploratory phase;

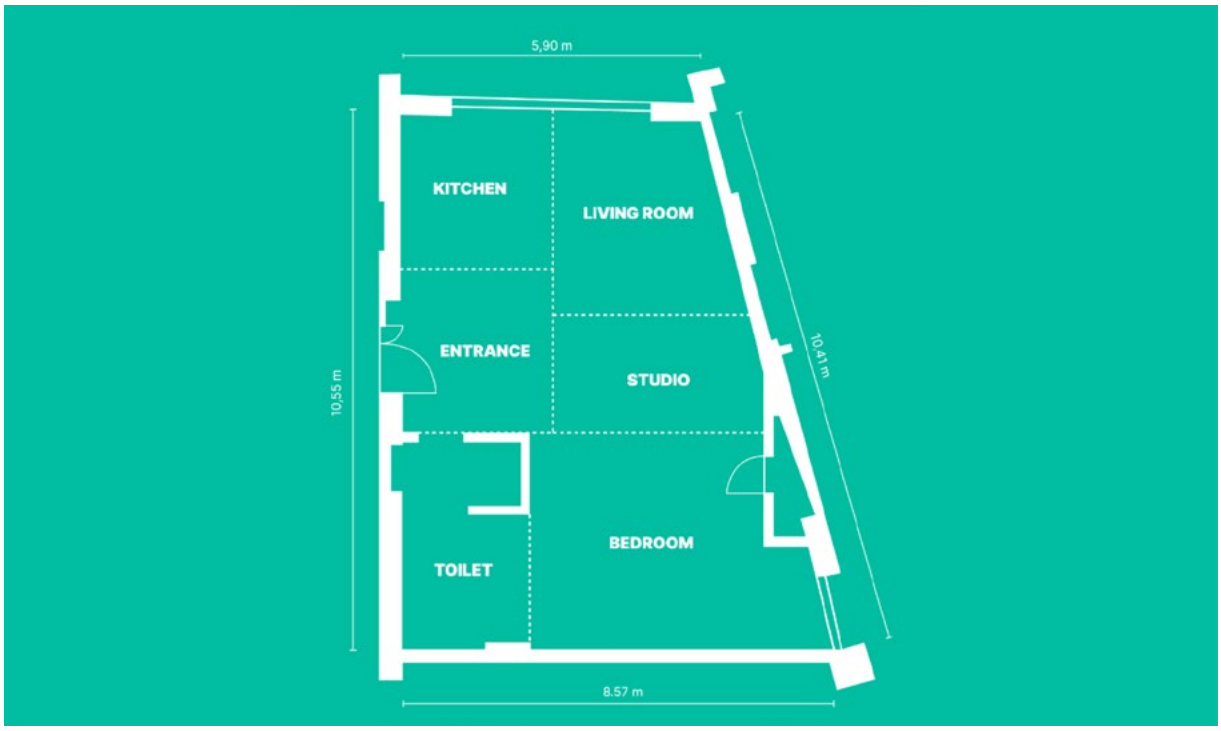

Fig 1. Floor plan of the Living Hub (credits: Annapaola Vacanti)

- leveraging users' knowledge as co-creators in the definition phase;
- quickly testing mock-ups during development phase;
- precisely evaluating prototypes in a realistic environment before delivery.

The Living Hub idea builds on the concept that HCD is intrinsically an empirical process, based both on quantitative and qualitative data relating to the physical and psychological characteristics of people, which are involved in a participatory way with the aim of adapting the project to their behavior and not vice versa, considering human diversity and seeking the best possible balance for the greatest number of users and for the system itself (Pheasant e Haslegrave, 2005).

4. Staging process and methodology [CP]

The laboratory occupies a space of 74 mq divided in 5 functional areas: entrance, kitchen, living room, studio, double bedroom, toilet [fig.1]. The simulated apartment is equipped as a movie set, with a system of trusses holding microphones, lights and cameras that can be managed from the nearby control room. A sensor system will also allow to record the movement of users within the space during experiments, producing precise data regarding interaction with prototypes and people's habits. The setting has been designed with a modular approach, reducing the interventions on the architectural structure of the apartment to the minimum necessary. In fact, the open space presents no internal walls, exception made for the shower corner. The rooms have been set up by taking advantage of wardrobes and drawers that physically divide the functional areas so that those pieces of furniture may also be moved in different positions to create new settings for other scenarios.
The basic setting has been designed based on three proto personas, defined to identify the focal areas that require versatility to produce different scenarios. It has been studied how a visually impaired person, a person on a wheelchair or a person with cognitive impairment would use the space and what their habits at home would be. It was highlighted that kitchen and toilet pose the biggest challenges, which have been faced by finding solutions that allow to quickly modify furniture and enlarge/reduce the moving space of each room. Specifically, the toilet may be enlarged to allow a wheelchair to rotate inside the room and easily access the bath or reduced to simulate a situation where the user must be supported

Fig 2. The setting of the simulated apartment (credits: Giorgia Cosso)

in carrying out his activities. Similarly, the kitchen allows different settings of the furniture, which stands on wheels to be quickly repositioned [fig. 2].
The basic setting aims to be the foundation to produce countless variations that may suit the objectives of specific research activities. For such reason, no IoT elements have been embedded in the design of the apartment, which simulates a very traditional environment. Nevertheless, smart products (lights, appliances, plugs) may be introduced later and be used as distractors during simulations, in order to generate data that considers the whole context in which users carry out their activities.

5. Conclusions and further developments [NC]

The rapid succession of two financial crises and an ongoing health emergency constitute enormous challenges to our society, which require a systemic approach capable of solving the problems of users as well as to adapt our lifestyles to climate change and make technology and innovation accessible to all. The specific issue of making our homes adaptive and multi-purpose, to be able to reconfigure to the specific user's needs, is considered by the Italian Recovery and Resilience Plan (PNRR) (2021), which focuses its missions 5 and 6 on the creation of new models and approaches for achieving integrated care and allow all people, including fragile and ageing users, to be independent.
Being a simulated prototype of home, the Living Hub introduces new ways of managing innovation processes and may represent a valid answer to the greatly debated challenge of involving users in living lab activities (Fulgencio et al., 2012). If we consider the flow of knowledge that goes from users as a source of information to designers, simulated activities can be applied according to various methods and objectives to obtain useful data about the processes of interaction with technology; on the other hand, by its very nature, simulation can facilitate the opposite flow of knowledge, from technology-savvy personnel to users, who take personal advantage of the activities in the lab, coming into contact with innovative artifacts and having the chance to use them in a realistic scenario, immediately sensing the potential and repercussions of the proposed innovation on their daily life.
The lab's infrastructure is currently ready, while the staging process and furniture acquisition is ongoing. After its setting will be completed, by the end of 2022, Living Hub will be open to multidisciplinary activities aimed at accelerating the adoption of technologies and at generating ecosystems co-created with the users themselves. Further publication will present the results of the activities carried out within

with the users themselves. Further publication will present the results of the activities carried out within the lab; a place for training, meeting, confrontation, experimentation, co-design, aggregation between community players such as citizens, companies and universities.

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S.I.A.R.C. Sustainable Improvement for Aerial Rescue and Control

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Abstract

The SIARC project is part of the various current experimental research for the study of innovative solutions to be used for safety and aid for the development of sustainable communities independent from an energy point of view and with changes in social behaviors generated by systemic innovations implemented in a new scenario mobility for monitoring and rescue. Through the realization of a project of a functionally evolved drone called "SIARC", the proposal presented here is characterized by the use of clean energy and environmentally friendly materials and through the use of advanced technologies already existing and subject to various experiments in the field and total manufacturing in additive manufacturing. The results of the project are functional to the protection of anthropized environments (urban and archaeological) and for the first aid of people involved in accidents or emergencies, for the protection of cultural heritage / civil buildings and environmental reserves.

Keywords

Renewable Energy, Sustainability, Additive Manufacturing, Safety, Rescue

1. Introduction

The design interest has focused on the design of a multipurpose aircraft carrier which constitutes a unique type having combined the characteristics of an aircraft with those attributable to a normal means of transport. The result obtained is identified in an aircraft that can be conceptually ascribed to the drone sector due to its small size and structural definition. The combination of the performance of use of different technologies, partly already tested, allows the drone to be equipped with all the elements necessary for the most varied mission profiles, such as: surveillance of environmental problems, (floods, avalanches, earthquakes, etc. ...) or critical situations for infrastructures (structural failures, etc.) with recently developed systems for the realization of algorithms and sensors that address the aforementioned problems [1](Lappas V., Sang-Shin H., Tsourdos A., Lindgren D., Bertrand S., Marzat J., Piet-Lahainer H., Daramouskas Y., Kostopoulos V., 2022). A further advantage is the ability to provide assistance quickly, guaranteeing transport of basic necessities, medicines or organs for situations related to emergency medicine, as already demonstrated in the various experiments carried out for example in Japan in the pandemic period of Covid-19 with rather positive results, managing to replace human or traditional vehicles in different situations for the transport and management of care for patients infected with the virus [2] (Yakushiji K., Hiroshi F., Murata M., Hiroi N., Hamabe Y., Yakushiji F., 2020). Vehicle performance o are emphasized by the processing, closely linked to the product, of unprecedented induction charging platforms, to be positioned in strategic points to allow rapid recharging of the aircraft, powered by exclusively sustainable energy and obtained from photovoltaic systems. Drone technology combines SIARC with great operational flexibility, characterized by adequate speed, facilitated maneuverability and excellent load capacity, as demonstrated in the studies carried out to apply a new methodology to the San Raffaele Hospital in Milan with a drone service for the transport of medicines, aware of the various regulations and constraints still in force today [3](De Silvestri S., Pagliarini M., Tommasello F., Trojanello D., Sanna Y., Yakushiji A., 2022).

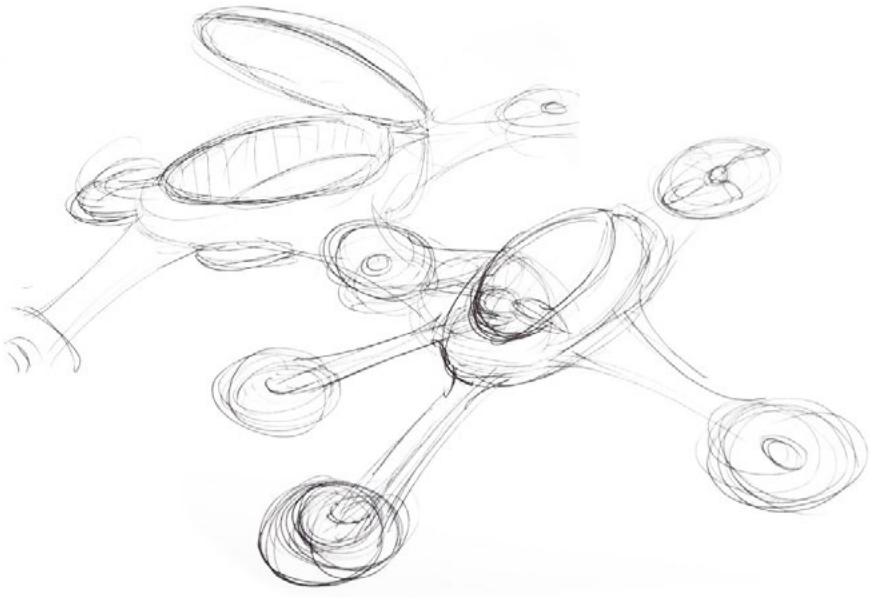

Fig 1. SIARC concept

2. The technological scenario

Currently, similar drones are already used by various Aid Teams, but are limited by constraints related to technologies, autonomy and interoperability. On this basis, it should be remembered how high is the interest of companies in the sector in bringing technologies to a level of performance higher than current standards, in fact, despite the fact that there are different types currently in use and which still allow performance to be obtained, just think of those for the delivery of defibrillators or which act as ordinary couriers for the delivery of packages, which form the basis for a design upgrade, allowing you to maximize performance. The project aims to guarantee increasingly performing solutions to be combined with the exclusive use of innovative and sustainable materials, obtained starting from the Industrial Additive Manufacturing. In this way it will be possible to guarantee a design oriented towards recycling, without decreasing the intrinsic mechanical and chemical capabilities. The drone has the ability to host the technological and mechanical systems that allow operations such as flight, vertical take-off, ensuring telemetry and directional microphones to be able to listen in case of emergency to the noises and voices of the survivors hidden in the rubble of a possible collapse like after an earthquake. The aircraft is equipped with the most performing brushless motors that allow a safe and ecological flight. Implemented software and hardware allow to reach a high level of attention to the ability to develop an "intelligent" system of interaction with the aircraft, and consequently, in a short time, all the fundamental data for the performance of use.

3. Project implementation in Industry 4.0

The project is based on the desire to manage the characteristic of innovation with the need for environmental sustainability, within totally sustainable communities, also thanks to the adaptability and flexibility of 3D printing. This technology is supported by an increasingly strong interest from the most advanced companies in the sector, which currently use it in various fields such as automotive or aerospace. Respect for the environment is significant, guaranteed both by the self-production of photovoltaic energy and by the savings in environmental costs due to the reduction of non-renewable energies (fossil fuels) used by large aircraft such as helicopters. Specifically, the reduction of the environmental impact supported by a small aircraft, but absolutely adaptable to the required mission

Fig 2. Conceptual Scheme Project

profiles, will demonstrate a great advantage from an environmental point of view and containment of operating costs for the operating companies. A further objective of the project is the ability to guarantee safety for the protection of the environment and citizens in flight BVLOS, which provides a very versatile type of approach allowing its use in the most critical scenarios As previously described, particular attention is paid to the choice of Virtual Engineering solutions; through 3D With the CAS / CAD tools it is possible to define the design of a vector in a virtual environment, simulating all the typological configurations and the related formal declinations. The design method attributable to augmented reality has also been contemplated, according to the modern principles of industry 4.0, in order to eliminate and reduce the obsolete phases of the design process ion and production, for the cons truction of the aircraft.

4. Methodological objectives; design for disassembly in APR design (drones)

In our experimental research we used an operating methodology that can be traced back to design for disassembly which involves a design aimed at managing the assembly and disassembly phase in a simpler way in order to optimize times and reduce costs, also creating single material components in recyclable material [4](Negrelli V.,2018). such as the use of recyclable thermoplastic polymers such as PLA. This material is demonstrating excellent capabilities in production using FDM 3D printing technology, managing to reproduce structural parts with good maximum stress parameters, appropriate for our SIARC project [5](Shelare S.D., Aglawe K.R., Khope P.B.,2021). The following materials are contemplated in the material abacus of the SIARC project: Plastylene or a new filament that is successfully used in the production of flexible packaging where biodegradable and compostable bio-plastics of biological origin (biopolymer Ingeo ™, Mater-Bi®), recyclable bioplastics (I'm Green ™) and polyethylene (PE) 100 % material T regenerated SIARC project approach a high sustainability rate, characterized by the possibility of optimizing the quality and quantity of materials during the production phase with the additive technique, of the life of the product.

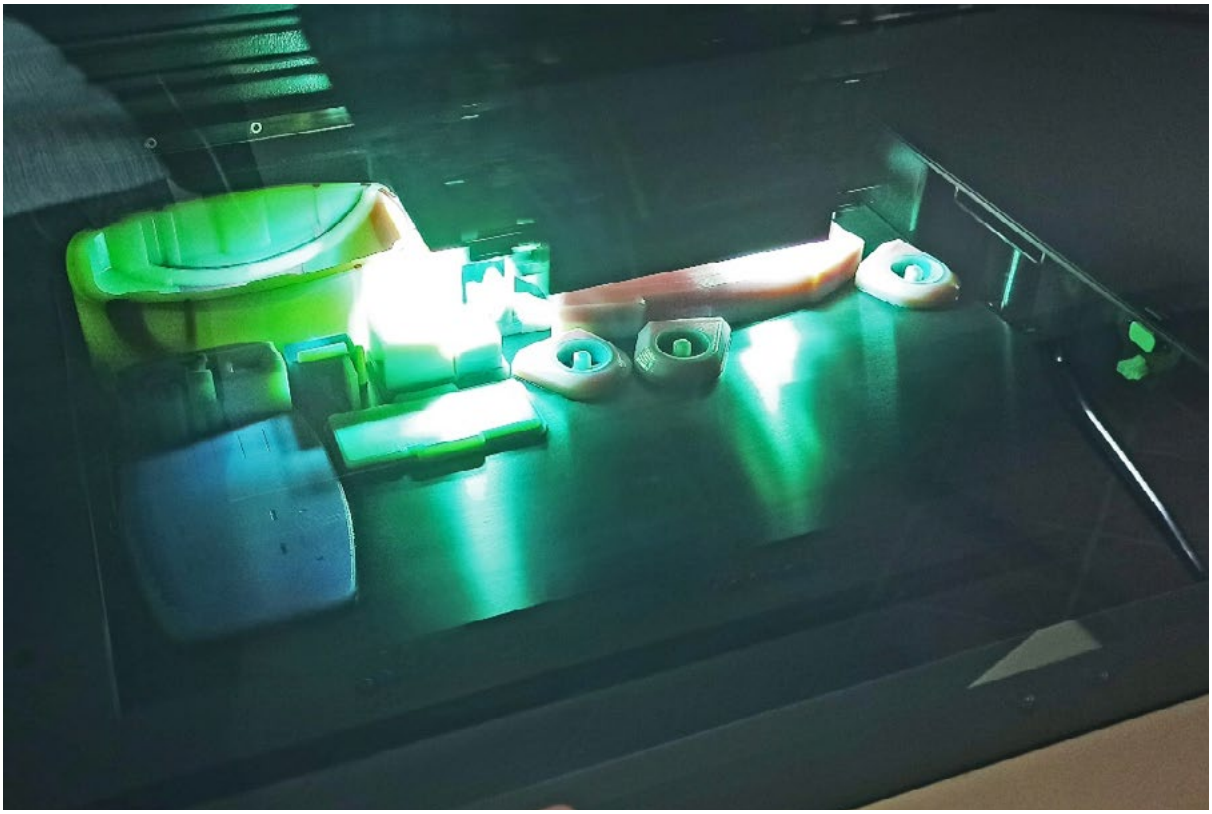

Fig 3. 3D Printing of a scale UAV prototype

5. Objectives and results

The fundamental objective of the SIARC project is to generate a new and unprecedented drone concept characterized by a highly eco-sustainable approach aimed at managing a "multipurpose" mission profile, that is a multifunctional and versatile remotely piloted aircraft. The project proposal is therefore identified as an "operational tool" intended for different and adaptive uses to multidisciplinary scenarios to convey studies already carried out in a new design vision that tends to lay the foundations for deeper and more innovative experiments. Taking into account the fundamental function of transporting goods, medicines or organs, it will be possible to respect a transportable weight with a maximum capacity of about 15 kg based on studies already carried out on the load of the APR and on some types of transportable goods [6](Scalea J.R., Restaino S., Scassero M., Bartlett S.T., Wereley N., 2019).
Furthermore, different voices demonstrate the drastic reduction in transport costs compared to traditional air vehicles, thanks to the average distance that can be traveled with these technologies which has increased by about 60% [7](Scalea J.R., Restaino S., Scassero M., Bartlett S.T., Wereley N., 2019).. Analyzing the product scenario, it should be emphasized that SIARC is self-sufficient from an energy point of view ; Starting from the propulsion and power supply thanks to a brushless powerplant with a latest generation high-performance battery, a charging protocol has been studied that takes place through special platforms that use photovoltaic technology to charge the drone batteries and the recovery itself. pack (buffer battery for night missions). This approach will be further improved thanks to the pursuit of innovation, that is to raise the performance of use of the aircraft compared to the competition, with an increase in the maximum load standards thanks to unprecedented operations of choices and materials that act in terms of lineweight structure.

6. Conclusions

SIARC represents the synthesis and implementation of different technologies and experiments towards a targeted approach to the environmental needs of industrial products. To generate a complete and adaptive solution for sustainable communities that can benefit from a real solution to the various problems that have occurred over the years in this area, with a production that is attentive to the principles of environmental sustainability.

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Sustainable design in urban renewal: a case study of waterfront landscape shared infrastructure of Shanghai, China

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Abstract

The rational design of an urban renewal strategy provides an effective and green method for balancing the requirements of rapid development and the limitations of existing resources in urban renewal. Currently, although the conception of the sustainable design has been widely introduced in most urban renewal projects to reduce various environmental loads, few of them have applied to construct practical landscape infrastructures in a cost-effective manner. In this contribution, a renewal case of waterfront public service facilities in Shanghai, China has been analysed, for discussing possible solutions for the versatile implementation of sustainable designs in landscape facilities renewal in an affordable fashion. In the analysed case, two representative models are defined and demonstrated for the applications of the sustainable design strategy to improve the urban ecology environment and meet the needs of citizens in daily life. The first model is the architectural-view model, which includes a variety of fundamental space layout design and architectural construction methods, such as green materials, low-carbon constructions, and energy-saving management. The second model is the human-centered care model, which includes the requirements of reading, communication, parent-child, and other human-friendly space from a citizen's point of view. The analysed results will be beneficial for beating current design barriers in practical construction of a sustainable urban community and stimulating new social innovations on green landscape infrastructural design in the future.

Keywords

Public service facilities, urban renewal, Human-centered, environmental design, Sustainability, Green infrastructure

1. Introduction

With the economy's growth, the burden on the earth's environment and material resources shortage is getting heavier. The designer's exploration of the relationship between man and nature, which can protect the natural environment and the sustainable development of future generations, is one of the critical issues in modern landscape design. Improving urban waterfront leisure landscape space is an essential part of ecological civilization city construction in the context of urban renewal projects in Shanghai (Song, 2021). They have included the city's historical buildings, old communities, infrastructure, and outdoor public spaces. All these successful cases have become the landmark of the town. Based on the perspective of the urban sustainable design concept, this paper analyses the practical significance cases to show how micro-renewal cases of waterfront public service facilities in Shanghai to solve the problems in sustainable designs in urban renewal, which by water-saving techniques, renewable materials, and smart city digital management technique.

With the development of public green spaces on both sides of the Huangpu Riverside in Shanghai, the connected riverside greenway is a gathering point for residents' daily lives. A hotspot for the professional visited and tourism (Wu, 2021). However, the lack of facilities for humanized service space makes it

Fig 1. River Viewing Service Station #2 (https://www.archdaily.cn/cn/909305/shang-hai-huang-pu-dong-an-wang-jiang-yi-zhi-zheng-jian-zhu-gong-zuo-shi).

very inconvenient for people to travel. At the beginning of 2017, many complaints from citizens and tourists were about the phenomenon of "constantly walking," "exposure to the sun," and "Public toilets" on the vast and long public greenways. The related small public service facilities are in need. Not easy to recognizable and abandoned service space due to unreasonable layout and supporting functions that do not meet the needs of citizens (Othman, 2021). Those problems call the design urgency for service facilities space renewal in the waterfront area.

2. Strategy and Methods

Sustainable design (also known as environmentally sustainable design, eco-friendly design, etc.) is the philosophy of designing physical objects, built environments, and services to adhere to social, economic, and ecological sustainability principles. The sustainable design aims to "eliminate negative environmental impact through Visualize data. " Expressions of sustainable design require renewable resources, maximize ecological impact, and connect people to their natural environment.

2.1 Cost-effective design of public service buildings

In response to the needs of urban public management, small public service buildings need to be designed with a short construction period, low-cost, durable, and energy-saving and emission-reduction solutions. The East-bund “River Viewing Service Station” is a steel-wood hybrid system based on a glulam structure to achieve ultra-fast construction with controllable quality. The factory has a high prefabrication rate and is suitable for a construction environment with minor impact: high integration and proper segmentation of design and construction to maximize quality in a short period.

2.2 Shaping community power and local culture

Sustainable design for public buildings is not only a life cycle issue but also an understanding of systemic cultural change. In The East-bund “River Viewing Service Station” of Shanghai (see figure 1), combined with the cultural communication with the streets or the government, with the theme of "world meeting room", it conducts participatory cultural exchanges for residents. Named *Wangjiangyi* Station No. 4, it is facing the public to create a "never-ending" Internet celebrity product experience point, which is not for shown on the spot but also can purchased directly by scanning the code (Wang, 2020). In the evening, the station transforms from a city study room into a live cultural studio, inviting domestic and foreign experts and celebrities to share themes. The theme of each River Viewing Service Station is different. Considering the expression of different cultures, there are party-building themes, reading themes, science and technology themes, and parent-child themes, transforming from a cultural station

Fig 2. West bund Server Space Station, *Shuianhui*. (Photos by author).

on display to an immersive educational experience that can be participated.

2.3 Effective reduction of energy consumption of public service facilities

West bund Server space station (*Shui'anhui*) is a public service chain segment developed by West Bund Group and the government. It aims to build a 5-minute living circle and build 20 convenient service stations within six significant functions (Wang, 2020; Li, 2019). The West bund Server space station's logo comprises six drops of water, representing six primary service functions: hygiene, information, rest, sports, storage, and emergency. It allows everyone to enjoy a new experience of waterfront public services that integrate "art + ecology + service."

The "Intelligent Life Service Station" supporting the *Shui'anhui* integrates traditional drinking fountains, "asking for directions" orientation, vending machines, and toilets as a comprehensive service station (see figure 2). In the overall space design, the plane of the facility layout takes the central island as the core service platform. This service site has a similar architectural shape and is easier to identify, forming a unique public service structure in the West Bank. The surrounding free space provides resting seats, bookshelves, reading desk for tourists to relax and read. At the same time, special theme services are formulated according to the different positioning of the station. At the West Bund Long Museum site, running station is the unique theme station for sport lovers. The station is called "*Shui'an Huiyun* Building Station." In addition to the usual functions of drinking water, rest, and toilets, the daily needs of the service are provided. It also adds item storage, food heating, and hot water supply featured by site sports. Sports activities are not a single-line stop but can also be a personalized auxiliary space like a gym. And they are equipped with AED emergency service equipment at service sites to ensure emergency medical supplies. At the *Chunshen* Port site, according to the particular circumstances of the elderly and children, dedicated service will be built to provide the reasonable use of auxiliary facilities by tourists.

Waterfront server station combines fixed service station + mobile secondary service system. The mobile phone APP (digital application, see figure3) displays the difficult problems in travel and life which can be queried in real time or made in advance (Wu, 2019). On the mobile page, the user can find the current location, tourist routes, landscape landmarks, parking lots, cultural venues, catering services, vending machines, sports facilities, toilets, and the usage of guard booths through the app. And combined with the display of the Baidu map. Users can quickly search for the nearest service site, and provide 24-hour assistance for citizens' travel without any assistance. The application of digitalization also saves the labour cost of public service facilities. Most of the service stations of *Shui'anhui* have opened the self-service management system, and only some volunteers or specific stations are on duty according to the surrounding elderly and children. This part of the digital management system not only saves the investment cost of service facilities but also allows tourists to enjoy a more relaxed and private space experience.

Fig 3. West bund Server space station (*Shuianhui*) mobile APP, (photos by author).

3. Conclusion: Future Implications of sustainable strategy in urban renewal

Landscape facilities are designed from scratch in the history of urban outdoor public space development. However, the public service facilities need to be developed more comprehensively according to the quality of space and habitant comfortability. By sustainable strategy innovation involved in the design process, the public service space is more sustainable in terms of materials and environmentally friendly construction technology. The analysis of the spatial layout and the human-centered needs of citizens inspires designers and governments to transfer sustainable design ideas into urban renewal projects. Such as providing diverse activities for citizens to create social contact from the community to the whole city. At the same time, it is necessary to combine the smart city system in the public service applications by using the Internet, mobile terminals, and interactive media to penetrate people's lives. The improvement of public service space gives people a sustainable community environment and improves the urban service quality of Shanghai. To provide robust and soft power support for building an international ecological and healthy urban life in the future.

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Beyond current limits: building occupants and climate change

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Abstract

It has already been more than 30 years after UN report revealed on 1987 with the name of "Our Common Future" written by Brundtland. The report introduced the term "Sustainability" which may be the most used term/topic for energy related research in the 21st century. The agenda of the academy and professional life with international institutions focus on energy consumptions of the world which is on the edge of global warming leading to climate change as a reality. Occupant behaviour is one of the main drivers of the consumption of resources and reasons of waste production in the world leading. For this purpose, this study focuses on effects of occupant behaviour to the climate change based on deep analysis of papers in English indexed in Scopus database published in the last three years. The outcomes are discussed in detail for future projection.

Keywords

building occupant behaviour, climate change, development, literature review

1. Introduction

Humans, who spend most of their time indoors, drive the energy consumption and greenhouse gas emissions around the world. Based on the Copernicus research program of the European Union (2022) considering the global surface temperature, the last seven years have been the warmest years on record by a clear margin. National Aeronautics and Space Administration (NASA) (2022) reports that the increase in surface temperature since 1880 is 1.0 °C and seal level is 3.94 inches high compared to 1993 which is attributed to anthropogenic climate change. The world is struggling with this climate change and global warming, as evidenced by the wildfires in Australia, California and Turkey, and the melting of polar ice caps.

The built environment consumes a significant fraction of global energy use, typically estimated at 30 to 40% of total energy use; however, this energy use is mostly directly driven by the need to provide comfortable indoor conditions for building occupants. In that sense building occupants are what consumes energy, emits greenhouse gas and produces waste in buildings. Occupants have a direct effect on heating, cooling, and ventilation of buildings. Occupants, by their presence, make not only a passive contribution to energy balance of buildings but also, they may have active roles for the activities such as defining and changing set points, opening and closing windows or lighting switches (Harputlugil et al., 2019). This complex and intricate interaction between occupants and buildings is the subject of a significant amount of research. Some of this aims to investigate in depth when humans feel comfortable in buildings, and what factors play a role. Other research aims to classify and predict various occupant behavioural patterns. Yet other work aims to change occupant behaviour with the ultimate aim of reducing building energy use. There also is significant work on social and economic contexts of occupant behaviour, studying issues like fuel poverty and the interrelation between indoor conditions and occupant health and productivity. In general, our knowledge on the subject is growing, but there are still areas (such as the adaptive heat tolerance and resilience of humans) where current assumptions are limited and where future research is needed.

Climate change is a slow and gradual process. For building science this means that the impact of global warming is typically studied using predictions that come from climate scientist, who develop advanced models that can be used to produce future weather data. This future weather data will be applicable for long-term time horizons, such as the 2050 or 2080s. Typically we think of climate change as global warming, and capture this as warming of the climate of a few degrees centigrade, depending on assumptions about the emission scenario which may range from 'business as usual' to a 'sustainable development pathway'. However, there may also be more extreme consequences, such as the occurrence of longer and more pronounced heat waves. This is a second area where limits are moving, and knowledge is incomplete. This paper reviews the current literature on the interaction between occupant behaviour and climate change, pinpointing areas that urgently require further research.

2. Methodology

To investigate the state-of-the-art, a thematic analysis was carried out on academic journal papers that were retrieved using Scopus, which feature both the terms 'climate change' and 'occupant behavio(u)r'. Only articles written in English were selected. The search period was limited to recent years, and included 2020, 2021 and 2022. Initially a total of 129 articles was found. Based on screening of titles and abstracts 26 of them was chosen for deeper review. Finally, 16 of them were analysed in full depth. Results are presented in Table 1.

3. Discussion and conclusions

Review and research papers analysed were from developed countries, mostly from hot climatic regions are all from northern hemisphere. Most of the papers focused on effects of on buildings considering occupant behaviour. Residences were the most building typology followed by offices, commercial, and educational buildings respectively.

Most used keywords after climate change and occupant behaviour are energy related terms such as energy efficiency, energy consumption, energy simulation, energy use etc. Generally, all papers stress that global warming and climate change are existent realities. In the 16 papers that combine the study of climate change with occupant behaviour, core topics are:

- building robustness (ability of the building to provide thermal comfort in spite of more challenging summer conditions), assuming specified occupant behaviour;
- opportunities to mitigate for overheating by adapting/modifying occupant behaviour;
- investigation of the current and future expectations of occupants in terms of thermal comfort;
- the combination of climate change and occupant behaviour is an important consideration for retrofit decisions.

The core methodology for studying the impact of climate change seems to be the used of building performance simulation followed by data analysis. Typically, different future scenarios with different timelines (from 2010 to 2100) are evaluated by the help of simulation programs. Papers generally agree that in the future, for buildings, continuous reductions in energy requirements for heating and increases in energy requirements for cooling are to be expected (Pajek, L., et al., 2022). Climate change-related global warming may endanger human health, particularly in underdeveloped and densely populated areas (Liu, Y. et al., 2022). Different types of deterministic and probabilistic models were structured to define occupant behaviour. However, due to the complexity of humans, it is not easy to capture, estimate, model or calculate the behaviour of building occupants. The lack of standards and protocols for data gathering with accuracy is a challenge in the field of building occupant research.

The limited return of papers to the search (n=16) suggests that there still is only limited knowledge on occupant interacting with buildings under climate change. Mostly, occupant behaviour is still considered at the individual building-scale and not at the urban-scale. Habits, attitudes, lifestyles differ across cultures, regions, climate, geography, and local topography, yet this is not taken into account.

Table I. Analysis of reviewed papers.

Type	Location (City/Country)	Methodology	Building Type	Outcomes	Reference
Research	Different cities / Europa	Simulation, Data Analysis (Multiple Linear Regression Analysis)	Residence (Single Family House)	Decreasing energy needs for heating and increasing of energy need for cooling of buildings is expected	Pajek, L. et al. (2022)
Research	China	Simulation, Data Analysis	Residence	Global warming involves potential risks to human health and energy consumption	Liu, Y. et al. (2022)
Research	Greece	Simulation, Data Analysis	Residence	Behavioural change is a major approach for energy efficiency,	Koasidis, K. et al. (2022)
Research	Switzerland	Simulation, Data Analysis	Different Building Types	In a long-term perspective, passive cooling might be a solution	Silva, R. et al. (2022)
Research	Hong Kong / China	Simulation, Data Analysis	Buildings	Adaptive Thermal Comfort (District Cooling) globally applicable but behavioural change is challenging	Kwok, Y.T. et al. (2022)
Research	Europa	Statistical Data Analysis based on Eurostat data	Residences (Household sector)	Changes in choice of green energy supplier may contribute to reduce GHG emissions	Jakučionytė-Skodienė, M., et al. (2022)
Review	Not Applicable (NA)	Review	Residence, Office, Educational Buildings	For energy conversation, several factors should be considered in earlier design stages.	Verichev, K. Et al., (2021)
Research	Rende / Italy	Simulation, Data Analysis	Residence (Apartment)	Occupant behaviour plays a significant role considering the impact of systems.	Fajilla, G. et al. (2021)
Research	Naples / Italy	Simulation, Data Analysis	Neighbourhood (Apartment, shop, office)	Retrofit combination strategies considering energy measures strategies -such as measures on the envelopes and on the primary energy systems – can contribute to reduce primary energy consumption , operational costs and carbon emissions.	Ascione, F. et al. (2021)
Research	Switzerland	Material Flow Analysis	Buildings	Consumers have a direct effect on greenhouse gas emissions	Matasci, C., et al. (2021)
Research	California / USA	Simulation, Data Analysis	Residence (Zero Net Energy-ZNE)	Occupant behaviour should be considered for design, operation and regulations related to ZNE Homes to ensure robustness for energy performance	Picard, T. Et al. (2020)
Research	Southern Italy/Italy	Questionnaire, Simulation, Data Analysis	Residence (Apartment)	Occupant behaviour - controlling indoor thermal environment - has a notable impact in each climatic scenario implemented.	Fajilla, G. Et al. (2020)
Research	Southern European Cities/Europa	Simulation /Data Analysis	Residence	Considering comfort models, adaptive set point temperature may provide opportunities compared to static model for energy saving.	Bienvenido-Huertas, D. Et al. (2020)
Research	China	China Building Energy Model (CBEM)Based Analysis	Public Buildings (residential, commercial)	Energy use will be higher, and carbon emissions are predicted to peak around 2020 to 2035.	Guo, S. Et al. (2021)
Review	NA	Review	Buildings	Considering human factors such as energy-related occupant behaviours, social-technical solutions might be developed for sustainability and wellbeing of humans.	Gan, V. J. Et al. (2020)
Research	Different Cities/China	Survey, Data Analysis	Residence	Background of occupants -education level, traditional culture, and energy costs- directly affect the cooling behaviour related to usage of single split Air Conditioning (AC).	Hu, S. et al. (2020)

The limited return of papers to the search (n=16) suggests that there still is only limited knowledge on occupant interacting with buildings under climate change. Mostly, occupant behaviour is still considered at the individual building-scale and not at the urban-scale. Habits, attitudes, lifestyles differ across cultures, regions, climate, geography, and local topography, yet this is not taken into account. Future research should pay more attention to lifestyles to understand profile and patterns of occupants. New attributes should be defined for occupancy, especially for quantification of socio-cultural habits like attitudes and lifestyles.

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Design for sustainable behavior: strategies for understanding behavior change

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Abstract

Human behavior are responsible for environmental, economic and social problems. To behavior change it is necessary understand the factors involve this change. Therefore, Design has been applied strategies to understand the behavior change. The information obtained are used in Design tools and steps. In this sense, this article aims to present strategies for understanding factors that are associated with behavior change towards sustainability. In this way, assist and facilitate the decision-making process in Design.

Keywords

Design, Design for Sustainable Behavior, Behavior, Behavior Change, Sustainability.

1. Introduction

The economic, environmental and social problems in the society has highlighted the responsibility of each one. Unsustainable behavior can cause irreversible catastrophes on the planet (Christmas, 2009). In the scope of Design for Sustainable Behavior, there are models with strategies that contribute to behavior change. One category of the strategies identified is to improve the understand about some factors associated with behavior change. According to Fogg (2009), to understand behavior change it is necessary understand the factors that drive human behavior.
In this sense, this article aims to present strategies for understanding factors that are associated with behavior change towards sustainability. In this sense, assist and facilitate the decision-making process in Design.

2. Design and Behavior Change

Human behavior are responsible for environmental, economic and social problems. Many products and services were not designed with focuses on sustainability. Design plays a significant role in behavior, because can create desirable and undesirable changes, intentional or unintentional (Lockton, Harrison & Stanton, 2010).
Considering products and services change behaviors, Design has a strategic role in changing behavior towards sustainability (Niedderer, et. al, 2014; Ludden & Hekkert, 2014). Design for Sustainable Behavior has advanced in research and contributed to sustainability through projects that were intended to change behavior (Daae, 2014).
To behavior change it is necessary understand the factors involve this change. However, human behavior is complex and the result of a diversity of interdependent factors. To improve understanding, this complexity of factors associated with human behavior can be analyze in parts. So, it is possible focuses on a certain factor, that contribute with the delimitation and decision-making process of Design.

Tab I. Strategies to understand behavior.

Models	Strategies to understand behavior
Channel Design model	Understanding the individual's vulnerability based on individual characteristics and states and external conditions
Choice architecture model	Understanding the architecture related to six principles: Incentives, Mappings, Patterns, Human Errors, Complex Choices and Feedback
Evidence-Based Service Design model	Understand the Physiological, Cognitive, Emotional and Functional experiences that are satisfactory to the individual from three levels: individual, interpersonal and community
Mindspace model	Understanding the individual's conscious thinking
Health Beliefs model	Understanding the person's beliefs about health

3. Method

This is an unsystematic review of the literature aims to identifying strategies for understanding behavior change. For that, were analyzed articles (Science Direct databases) that present models applied on Design for Sustainable Behavior. From these models, it was possible to extract strategies for understanding factors associated with behavior.

4. Result

In this sense, strategies that contribute to increasing the understanding of factors associated with behavior are identified in the Channel Design model (Wünderlich et al., 2019), Choice architecture model (Thaler, 2015), Evidence-Based Service Design model (Liddicoat, Badcock & Killackey, 2020), Mindspace model (Dolan, 2009), Orchestra model (Pearce & Zare, 2017), Health Beliefs model (Champion & Skinner, 2008), and NADI model (Bijl-Brouwer, 2017).

5. Analysis and Discussion

The table I [tab. I] presents the synthesis of strategies to understanding behavior.
The Channel Design model uses strategies to alleviate the individual's state of vulnerability. The strategies used in this model to understand the behavior search for information about individual characteristics (ethnicity, chronological age, gender, physical and mental health conditions, pathologies), individual states (individual's motivations and emotions) and external conditions (Market and society) (Wünderlich et al., 2019).
Obtaining these information, it's possible identify individual's Vulnerability. So, it contributes to proposing solutions in services for inclusion. Therefore, if an individual has the possibility to live well in society, regardless of their vulnerabilities, there is a contribution to social cohesion, for example.
The Choice Architecture model aims understand the architecture experienced by the individual in order to propose interventions for behavior change. The strategy for understanding Architecture is related to six principles: Incentives, Mappings, Patterns, Human Errors, Complex Choices and Feedback. From the information obtained, institutions (private or public) can influence free choice, with the aim of providing well-being to people (Thaler & Sustein, 2013).
The answers to these questions provide information that points to the potential or fragility of an architecture for the purpose. Architecture can separate or integrate people, exclude or include and/or make them more individualistic or solidary. And that can affect sustainability.

The Evidence-Based Service Design model also highlights the architecture as a factor associated with satisfactory Physiological, Cognitive, Emotional and Functional experiences. To achieve the desired results, the strategies works at three levels: individual, interpersonal and community (Liddicout et al., 2020).
In comparision with the Choice Architecture model, which does not consider services in the scope, the Liddicot et al. (2020) focuses on evidence from services. The levels - individual, interpersonal and community - that are highlighted by the authors contribute to choose strategies for behavioral intervention.
The Mindspace model consider two ways to influence an individual's behavior (Dolan, 2009): (1) influence the cognitive model. The action is in the individual's conscious thought, stimulating reflection; (2) influence the individual's automatic judgment processes. The intervention is on the decisions that are made irrationally and unconsciously.
In this sense, in the Mindspace model, the strategies to understand behavior involve nine factors associated with the cognitive model and where the individual's automatic judgment processes are identified. The information obtained from these factors contributes to choose the intervention for behavior change.
The Health Beliefs model is widely used to explain, prevent, point out changes and provide guidelines for possible interventions to health-associated behavior (Rosenstock, 1974; Champion & Skinner, 2008).
In this sense, strategies are presented to obtain information about the individual's beliefs. This information is obtained through the perceived susceptibility, the perceived severity, the perceived benefits, the perceived barriers and the perception of self-efficacy (Champion & Skinner, 2008).
Although the strategies of the models presented are different, they can be used together. Knowing that there are other relevant factors associated with behavior, this contributes to behavior change.

6. Conclusion

Strategies for understanding behavior change contribute to obtain relevant information for use Design tools and steps. Strategies for understanding behavior change, in the models analyzed, are focused on specific factors. However, they can be used together, which expands the understanding of the behavior. Therefore, there is a broader view of the complexity that is human behavior. For future studies, it is possible to include other strategies that contribute to behavior change towards sustainability.

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Analyzing sustainability of green product certification systems using indicators of sustainable product

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Abstract

Sustainable strategies used during the development and production of products help in reducing environmental impacts and producing a more socially and economically sustainable product. To give recognition for a product's sustainability, there are a lot of certificates across the globe to help confirm that a product meets a certain standard and provides environmental advantages. Although most certification programs are concerned with environmental issues, the idea of sustainability focuses on achieving three pillars or dimensions. Therefore, this study's aim is to determine the evaluation criteria of selected green certification systems and compare them to parameters of sustainable product design to assess how far beyond green are current green certification systems. A set of sustainability parameters are collected through a literature review and two green certification systems, BIFMA Level and Cradle to Cradle program are selected to do a criteria-based comparative analysis.

Keywords

Green certification, sustainable product, evaluation criteria, BIFMA Level, Cradle to Cradle program

1. Introduction

Society today is more informed of the earth's environmental and climate change challenges than in previous decades. People are informed of problems such as deforestation, the increase of CO2, and other natural disasters and their causes. For this reason, there has been a rise in the need for environmentally friendly products and the use of sustainable strategies. The objective of sustainable development is to achieve long-term stability in the environment, society, and economy by considering concerns in all three dimensions through the process of making decisions (Emas, 2015). Green certification systems must be designed to assess the three dimensions of sustainability. The main challenge products face is being able to comply with all three requirements. However, most of the certifications have been developed to place an emphasis on "Green" standards while ignoring other factors of sustainability. The main objective of the study is to determine the evaluation criteria of selected green certification systems and compare them to parameters of sustainable product design to assess how far beyond green are current green certification systems. Green product certifying systems evaluate a product based on criteria organized in a set of categories such as material, energy efficiency, or waste. They give non-environmental professionals knowledge about some environmental issues of a product or service. The goal is to inform and persuade consumers and professionals to consider such concerns when selecting between products and services (Frydendal et al., 2018). Certification programs are classified as multi-attribute and single attributes relying on the parameters they depend on to certify products. Multi-attribute certification systems and labels verify products relying on the parameters of the lifecycle, such as energy use, air and water emissions from manufacturing use and disposal, and recycled content. Single attribute certifications focus on one environmental issue, such as energy, water, material, and chemical emissions that impact the environment (Vierra, 2018).

2. Methodology

Through descriptive research, a literature review on sustainable design and its parameters is done to identify the evaluation criteria of sustainable products. Consequently, Collection of sustainable product indicators is done to help in evaluating the green product certification systems. Finally, after a literature review on selected green product certifications and their evaluation criteria is done, a criteria-based comparative analysis of the certification systems is used as a method of analysis. The design of the analysis method is adopted from (Yuce, 2012), a study made on the evaluation of green building certification systems.

3. Literature review on sustainable product indicator

Each green product certification system uses its own set of indicators to evaluate a product which creates difficulty in evaluating the systems. For this reason, a set of indicators are collected from the literature to assess the certification system's completeness. The keywords used to collect the reviewed literature are measuring indicators and sustainable products. The reviewed literature provided numerous parameters to consider for green product certification systems. Even though the main focus lay on environmental indicators, parameters on other dimensions like social and economy are also given. Most of the researches have placed the criteria they propose in criteria groups. The same groping from the reviewed literature was used in this study and some groups for some criteria were additionally added. All of the criteria acquired throughout the literature research are categorized into one of three dimensions. There are six criteria groups (Material, Energy, Waste, Air emission, Water, and Product) under the topic environment having a total of 27 criteria. Under social dimension 10 criteria are collected under 2 groups: employee and customer, and under the economic dimension 10 criteria are collected under finance, employee, and customer criteria groups.

4. Criteria based analysis

Two green certification systems are chosen based on their evaluation behavior (If they are lifecycle-based or not), the diversity of aspects they cover, and the multicity of covered aspects. The two certifications that are selected in this study to be evaluated are BIFMA LEVEL and Cradle to Cradle certified products program. They are criteria-based certification systems, which do not use a life cycle assessment method to evaluate a product. Additionally, the certifications are multi-attribute systems using multiple aspects to evaluate products.

BIFMA LEVEL is a certification by the Business World and International Furniture Manufacturers Association, is one of the rare certificates especially for furniture production. It is a third-party and multi-attribute certification system. The goal of this voluntary standard is to develop performance requirements that include social and environmental elements across the supply chain to give quantifiable market-based criteria for furniture that is more sustainable (Standard, 2011). LEVEL 1 to 3 are the three performance ranks in the BIMFA program. Products are assessed in this certification program within four sections: *i.)* Materials, *ii.)* Energy and Atmosphere, *iii.)* Human and Ecosystem Health and *iv.)* Social responsibility (Standard, 2011).

MBDC (*McDonough Braungart Design Chemistry*) introduced Cradle to Cradle Certified in 2005. The Cradle to Cradle Products Innovation Institute (C2CPII) was founded by William McDonough and Dr. Michael Braungart in 2010 to help grow Cradle to Cradle certification internationally (Cradle to Cradle, 2021). The certification is a multi-attribute, voluntary, generic, private, and non-LCA based certification system that applies to materials, final products, and sub-assemblies according to the C2C Certified Products Standard (Minkov et al., 2018). Products are evaluated under five key categories: *i.)* Material, *ii.)* Health, *iii.)* Product Circularity, *iv.)* Climate and Clear Air Protection, *v.)* Water and Soil Management and *vi.)* Social Fairness. The program is founded on the principle of continual progress, therefore each of the standard's five core criteria areas has four attainable degrees of achievement: Bronze, Silver, Gold, and Platinum (Minkov et al., 2018).

Product certification systems differ in the way they evaluate a product and the criteria they depend on to state a product as sustainable. This study analyzes which dimensions of sustainability (environmental, social, economic) are considered and to what extent they are included in the two green product certification

system's evaluation process. To carry out the analysis indicators of the sustainable product collected in the literature review are used in the evaluation. Each criterion is given a required one point and if it is included in the product evaluation criteria of the green certification systems a score point of one is given, if not zero is given.

5. Finding and results

Findings of the analysis, which are best described in [tab. I] show that both of the certification systems do not 100% comply with sustainability parameters. They account for 50% of the total points available. BIFMA Level achieved a 5% higher result than Cradle to Cradle. It also obtained a higher score in the environmental dimensions section by having high scores in category groups "material", "energy", "waste", and "product". Cradle to Cradle achieved higher points than BIFA in group categories "air emission" and "water". This certification shows greatest weakness in the categories "waste" and "product". It does not use generation, reduction methods, and disposal management of solid waste during manufacturing and use when evaluating a product. Additionally, the topics under the category product such as multi-functionality, modular design, and design for repair are not given much attention. Both certifications achieved half or less scores in social dimension. They have a weakness in considering social dimensions in terms of customers in evaluating products. Moreover, Economical dimension is not considered in the evaluation of products in both certification systems. Comparing the certifications based on the environmental, social, and economic dimensions, BIFMA LEVEL leads in the area of environmental dimension, and Cradle to Cradle program ranks first in social dimension.

6. Conclusion

Most green certification systems give an emphasis to the environmental dimension of sustainability while addressing the three pillars of sustainability is also important. The selected certifications evaluate social dimensions besides the environment however it was not clear to what extent they measure the two dimensions. Depending on the findings of the analysis, it is concluded that both certification systems have weaknesses in achieving full sustainability. Cradle to Cradle certification showed the greatest weakness in the evaluating categories such as waste and product. However, it achieved a higher point than BIFMA in group categories of air emission and water.

The certifications mainly focus on the environmental aspects of a product and do not consider customers' needs regarding social sustainability. Adding consumer-focused criteria, such as noise and odor complaints, customer satisfaction, and quality of life in a product evaluation will create more socially sustained products. Therefore, certifications should consider including customers and user-focused criteria when evaluating a product.

Moreover, both certifications do not have any evaluating criteria regarding economic sustainability. They need to assess products based on criteria related to the company's finance, employee cost, and cost minimizations for customers to attain full sustainability. Finally, it is recommended that the BIFMA and Cradle to Cradle certificate programs to include criteria related to the three dimensions of sustainability to have a comprehensive evaluation system for achieving a completely sustainable product.

Tab I. Summary table of the analysis

Dimension of Sustainability	Criteria Group of sustainable Product	Required Points		BIFMA Score		Cradle to Cradle Score	
Environmental	Material	7	28	6	21	4	17
	Energy	4		4		2	
	Waste	5		3		2	
	Air emission	3		2		3	
	Water	3		2		3	
	Product	6		4		3	
Social	Employee	4	10	2	3	4	5
	Customer	6		1		1	
Economic	Financial	6	10	0	0	0	0
	Employee	2		0		0	
	Customer	2		0		0	
Total		48		24		22	
%		100%		50%		45.8%	

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Building Trust to Level 4 Autonomous Trucks for Environmental Sustainability and Road Safety

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Abstract

Level 4 autonomous drive (AD) technology developments are progressing. Parallel to technical progression, achieving user acceptance of this technology can contribute to environmental sustainability, reduce carbon emissions via optimized transportation time with fewer empty miles traveled, decrease driver fault-related crash rates by the support of driver wellbeing, and increase road safety for communities. Trust, as the main driver for AD acceptance, and trust constructs are researched with long haulage truck drivers using interviews supported by a preliminary trust questionnaire. Results show drivers' trust is lacking under changing weather, takeover, and highway exit manoeuvres while operating in AD. While participants' comments indicate that driver trust in AD trucks mainly builds around experience with system competency, it needs to be supported by human machine interface display designs to address drivers' needs to monitor AD and stay alert.

Keywords

Level 4 autonomous drive, trucks, sustainability, trust, human machine interaction

1. Introduction

Commercial transportation via trucks has a significant share in carbon emissions, around 32% in 2017, and this is likely to increase since then due e-commerce demands (United States Environmental Protection Agency, 2022). With increased logistics traffic and more trucks on the roads, fatality crash involvement of heavy trucks is also an issue, constituting 13% of the total fatal crashes between 2010-2019, hence deteriorating road safety for communities (National Highway Traffic Safety Administration, 2022). These statistics display a contradictory condition towards global sustainability efforts for greenhouse gas (GHG) emission reductions and design endeavours for safe communities. Level 4 autonomous drive (AD) truck technology, referring to self-driving trucks under limited conditions (SAE International, 2021), suggests efficient solutions by reducing transportation durations, supporting optimizations on number of trucks needed on the roads, hence create a reduction in GHG emissions (Dawkins & Gundogdu, 2021). In addition to positive environmental impact, previous studies show that Level 4 AD has the potential to contribute to truck drivers' wellbeing by providing rest opportunities while onboard and reduce driver faults involved in crashes. However, there are issues in distress from drivers' perspective; feeling of redundancy (Richardson et al., 2017), unable to fix system breakdowns, extensive training needs, loss of social contact and trust to AD (Trösterer et al., 2017). These are important findings to address, since consideration of multiple roles of truck drivers such as on-road route planning, guarding the goods, handling customs paper works, and carrying business liability indicate the presence of a driver onboard will prevail after introduction of Level 4 AD for trucks. Therefore, parallel to technical developments, understanding truck drivers' trust build up factors towards Level 4 AD technology with a user centric approach is important so that broad use of technology acceptance can be realized, and sustainability issues, like air pollution and road safety, can be addressed.

2. Technology Acceptance and Trust

The literature for AD user acceptance refers to many factors such as usefulness, ease of use, social influence and anxiety (Osswald et al., 2012). Supported by car specific (Choi & Yong, 2015) and truck specific (Fröhlich et al., 2018) research outcomes, trust plays a vital role among all.
Jian et. al.'s (2000) trust factors' study is taken as a baseline in this research. To create a novel approach for analysing driver trust factors towards Level 4 AD trucks, concept of trust is reconsidered both from psychological and human machine interface (HMI) perspectives. Robbins' (2016) trust subdivisions in psychology are compared and combined with trust factors from human machine interaction (Lee & Moray, 1992) and five unique trust constructs are defined. Coupled with Kyriakidis et al.'s (2015) and Jian et. al.'s (2000) studies, seventeen constructs in total are identified to assess how drivers build up trust towards AD truck systems. These constructs are competence, intention, integrity, reliability, predictability, expectations, perceived safety, familiarity, entrust, fidelity, security, confidence, harmfulness, beware of, mistrust, sneakiness, and deception. While previous studies indicate the significance of these constructs for trust building in general, we still have little knowledge on how these constructs can be manifested particularly with HMI designs. This is significant as the proposed positive environmental impact and road safety of AD is only possible with user acceptance and sustained use of AD. HMI is central in this experience as being one of the main points of interaction with the system. Therefore, it is important to study the ways of instilling trust to truck drivers with HMI screen designs.

3. Methodology

To be able to understand current status of drivers' trust towards AD and to identify instances where trust needs to be supported the most via HMI screen design, an interview study was designed. To better frame interview questions, a preliminary trust questionnaire was administered to 9 truck drivers. The trust questionnaire was designed referring to seventeen trust constructs based on analysis of Robbins' (2016), Lee and Moray (1992), Kyriakidis et al.'s (2015) and Jian et. al.'s (2000) studies. Informed by trust questionnaire, semi structured interviews were held with 12 participants to develop an in-depth understanding of trust support via HMI screens. Current technology truck cluster image, novel design HMI image cards, and HMI screen paper prototypes for Level 4 AD truck were used as probes during interviews. All participants held long haulage truck driving licence and performed active truck driving at the time of research. Attendance was held as voluntary, and no incentives were given.

4. Results

Responses to trust questionnaire show 45% of participants rate Level 4 AD as trustworthy and rest either do not trust or have no idea about AD [fig. 1]. Reliability under chancing weather conditions, perceived safety during manoeuvring and highway exit, and confidence to system manifested as continuous need to watch over the road and other vehicles are discovered as prominent factors and critical drive conditions, where trust support is needed while operating in AD.
Interview results indicate that displays that show vehicle system conditions (i.e., oil level, tire and air pressures, engine heat) are needed with high priority both for non-AD and AD trucks. Overall monitoring of the road and other vehicles, all around visibility including back of the trailer, and audio-visual warnings are referred as crucial for Level 4 AD trucks. Data communicates that HMI content might not impact trust to AD system alone; the distribution of participants who do not find AD trustworthy after trust questionnaire is similar to the distribution of participants who cannot foresee themselves taking a rest break during an AD journey [fig. 1] after the interview with use of probes. Majority of the participants were undecided and in refusal of the idea to be able to rest during an AD journey to improve their wellbeing. They see a constant need to monitor road, other vehicles and receive audio visual warnings from the HMI to make sure that the system is working properly. This is evident from the fact that majority of the participants placed road monitoring graphic card at the centre and placed all other HMI elements around it when they were asked to build their HMI screen with the provided image cards.
During closure of the interviews, most of participants said personal experience build up is very important in truck driving and drivers give conditional decisions for most manoeuvres considering the load, road surface, weather, and other vehicles. Research findings show that system competency to perform

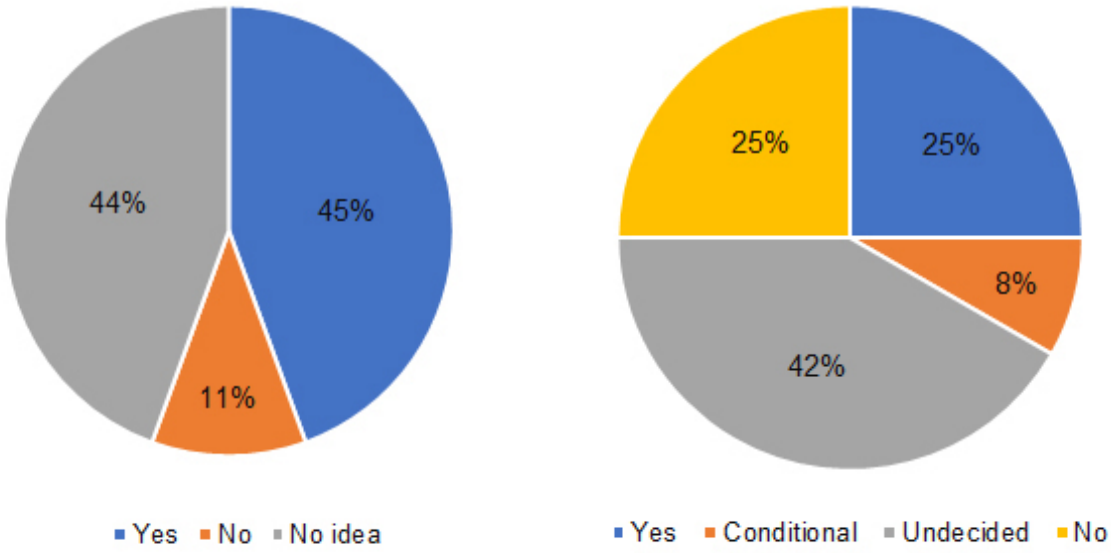

Fig 1. Left: Response to Trust Questionnaire: *Do you think AD trucks are trustworthy?* Right: Response to Interview Question: *After the interview, I can trust AD to take a rest break during an AD journey.*

flawless driving task would be the main driver to build trust to AD trucks, and HMI displays would support trust build under critical drive conditions by addressing drivers' need to monitor AD system, road, other vehicles and stay alert.

5. Conclusion

This research reveals that Level 4 AD technology is still not much known by their potential users. There is more to discover from drivers' rich experiences regarding the way they handle road, weather, other vehicle conditions and make drive decisions. These can play crucial role to support Level 4 AD technology acceptance. Participants mostly believe that Level 4 AD technology is competent enough to perform straight ahead highway driving but there are trust issues for reliability, confidence, and perceived safety under changing weather conditions, manoeuvring and highway exists. These are affecting the overall trust to the system. Research findings show drivers are in need to monitor the road and environment, receive audio visual warnings while traveling with AD, and majority of them would be unwilling to hand over the drive under listed critical drive conditions. These results support Choi and Yong's (2015) trust subdivision descriptions towards AD and Krupenia and Selmarker's (2014) work; the need for visual and audio warnings to stay aware and alert during AD journeys.

The findings indicate that the main driver of trust towards Level 4 AD is experience with system competency and making sure that driving task is performed perfectly. At the same time, results from the study indicate that these are not enough on their own. HMI screens are found important to support trust build up by providing continuous monitoring of road, other vehicles and audio-visual information flow for awareness. With the light of this research outcomes, user centric development of HMI display is recommended to provide assurance to drivers that AD system has enhanced environmental vision and correctly assess other vehicles, changing weather, manoeuvring and highway exist conditions like an experienced driver. HMI displays would then leverage Level 4 AD technology acceptance and increase its effective use.

We can conclude that HMI display designs have a major role in bringing behaviour change towards AD with contribution to driver's trust. HMI designs should address monitoring needs of the drivers so that trust towards system competence is established. AD can than contribute to improved driver wellbeing by relaxation of the driver onboard. With realization of broad use of Level 4 AD technology, a reduction of trucks' share in GHG emissions through effective transportation planning can be achieved. This study

further communicates the relationship between AD trust and the resolution of environmental sustainability and road safety issues.

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13 For Nature / With Nature: new sustainable design scenarios

Game Experience: A Fun Form of Cultural Sustainability

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Abstract

The game experience is a means of cultural transmission as children's learning process starts through play. However, children consume ready-made toys too quickly. The encrypted age and duration limit appears to be the expressions of its rapid consumption. Digital games, in this context, are favored over analog games in the current game market, which eliminated the non-environmental requirements of supply-chain due to their potential of high availability from easily accessible digital stores. Regardless of the environmental disadvantages of the mass production cycle, analog games continue to provide a fun environment for children that contributes to their social and mental development. This paper proposes that educational and original toy designs should act as both. While improving children's critical thinking ability and creativity in an extended real-time period, they also should offer motor activities moderated by digital technologies, accessible through smartphones and tablets with upgradeable software support.

Keywords

Game experience, bizonal playground, sustainability, play, Boobox.

1. Introduction

Researchers have often studied the effect of play experience on learning. (Mustard, 2000; Gudiksen, Skovbjerg, 2020; Jorgensen, 2020). However, its role in cultural sustainability has had less attention in academic dialogues. As the concept of "cultural sustainability" connotes maintaining cultural practices for the next generations or establishing cultural transmission on various levels through education and communication, the play experience is the optimal medium to establish such communication with children. (Kriz, 2009). Related research in pedagogy and early childhood education has proved games' active role in learning. (Hiniker et al., 2018; Hromek & Roffey, 2009). Categorized as analog or digital, games create a fun experience for children. Analog games encourage children to participate in real-time fun. However, this experience lasts for relatively short durations due to the limited attention span of children. Digital games, on the contrary, provide the ultimate participation in more extended periods but are criticized by pediatricians as it obstructs the socialization of children by isolating them from the real world. (Brathwaite & Scheiber, 2008). The static character of board games caused by their constant content compels children to rapid consumption and interrupts their repetitive use. (Barbara, 2014). Industrial designers consider such obstacles as critical challenges to be solved during the design process of these games. Therefore, this study focuses on an extended game experience offered by “Boobox,” a thematic party organizer based on user-product interaction. The activities, thrills, and fun that Boobox offers with a bizonal game configuration covering digital and analog features help extend children's limited attention spans by provoking their academic and motor skills.

Fig 1. Boobox decomposed into its fragments.

2. Inspiration/Method/Innovation

Designed for a ghost-themed birthday party, Boobox assembles all the entertainment arranged by a mother to amuse her small visitors. Embedding different activities for children (such as singing, dancing, telling stories, imitations, memory games, coloring) in a board game, Boobox offers interactive and participatory party entertainment through various adventures and claims responsibility for cheering up a birthday party but with a horrified glimpse. As reading ability is a prerequisite for following instructions, the minimum age limit of the target group is six years and above. The children pass through a series of pavements on a haunted road by a spin wheel, working like dice. As the players progress, the directions on the haunted road offer them several adventures and activity opportunities to provoke their creativity and improve their theatrical skills.

Designed as a pyramid reservoir, Boobox is a small decomposable box with dice, an activity spin wheel, a dozen ghost pawns, and an oversized play-mat around which up to twelve kids can gather and play comfortably. [Fig.1] The players push the transparent caps on the spinning mechanism, which functions as dice on the one side and a spin wheel for the activity zone on the other, to move forward on the pavements. As they pass through these pavements loaded with various instructions, they encounter several adventures, a minority of which gratify the player, whereas the majority let them down repeatedly with a series of twilight threats. [Fig.2]

If one stops at the cells colored in black, he/she gets entrapped in a parallel entertainment zone until accomplishing the assigned activity or task. The player places the spinning wheel into the center of the spiderweb and then presses. [Fig.3] He/she is obliged to fulfill the selected task, which gauges specific capabilities of children. Having completed these tasks, the player can turn back to the haunted universe and continue his/her adventure on the insecure paves of the road. The back and forth journey of the players between two parallel entertainment zones facilitates the continuous stimulation

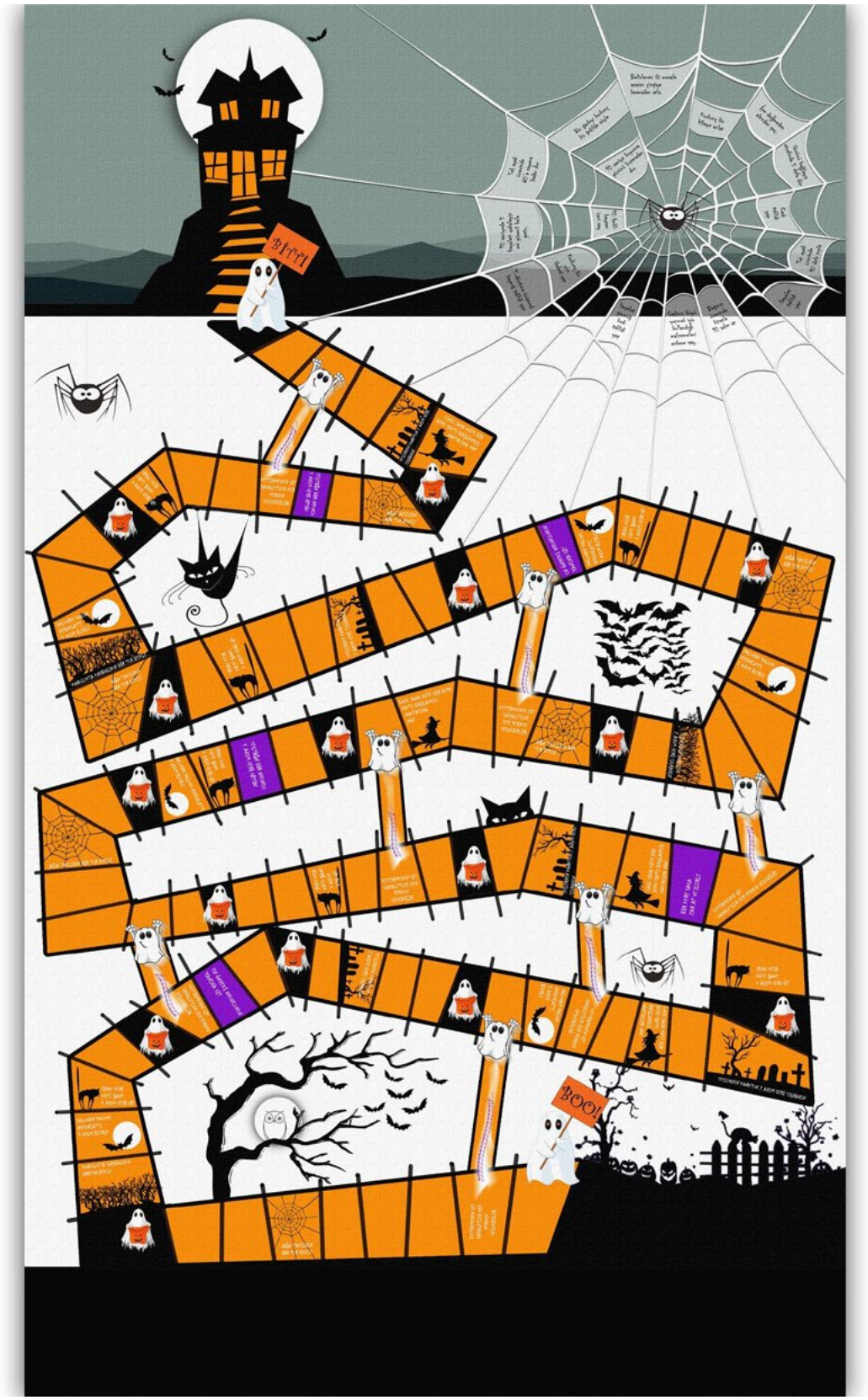

Fig 2. The oversized canvas, haunted road with activity zones.

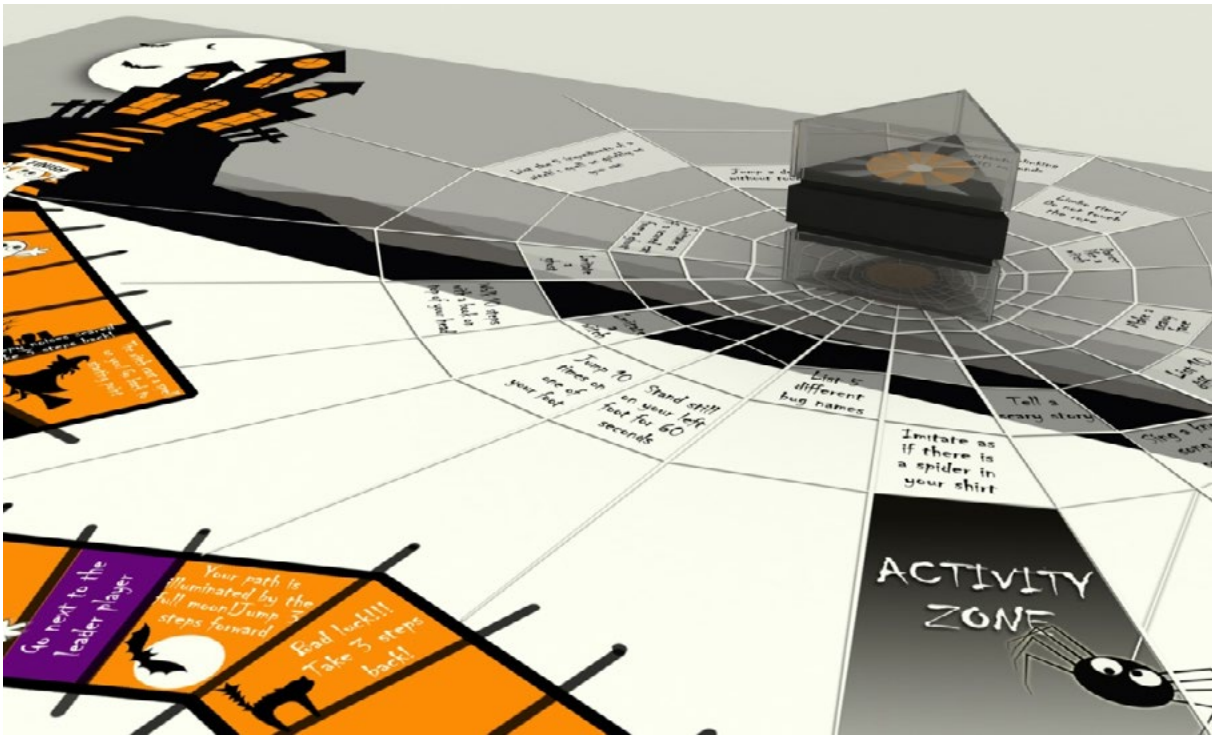

Fig 3. Spin wheel and the activity zone.

of children's concentration. This significant feature of Boobox helps to prolong the game period by revitalizing children's limited concentration-time over and over. The traps in the haunted universe and the challenging tasks in the activity zone turn the game into combat that the one reaching the haunted house at the end of the road experiences the thrilling feeling of triumph.

Due to bizonal playground editing, Boobox can be considered a methodical innovation, offering a more extended duration of game experience than any other classic box game in the market. Extending the concentration and focusing time of children six years of age and older, which are limited to 15 minutes, by the dual game design is achieved by the original bizonal methodology, dividing the board game adventure into sequential fun experiences with multiple activities having different contents and scopes. The bizonal methodology appeals to the different skills of the children and expands the game's scope for ultimate satisfaction.

3. Production / Realization / Technology:

Sustainability and design mobility are the significant concerns that condition design decisions regarding size and material selection. Aiming to bring children together with ecological materials, nature-friendly and recycled products, Boobox is manufactured from recycled materials. (Guan et al., 2013) Recycled plastic is the material preferred for the package. (Heljakka, 2022; Veelaert et.al, 2020) The pyramid form of the package is a continuation of the design language used for the game canvas, but at the same time, it enables an easy arrangement system on-shelf display. The package dimensions are approximately 75mm depth x 100 mm width x 130 mm height. One can quickly decompose the package into three main parts. Besides the main body, planned to contain the game canvas, there are two additional reservoirs: a pyramid block containing dice and spin wheel mechanism and a pyramid cap containing the player tags. There is no box cover. One can only insert the folded canvas from the hole opened after removing the spinning wheel mechanism at the bottom of the box. As reducing the dimensions of the package enables design mobility, the preference for a soft material enables the players to fold up the giant canvas to reduce its considerable size to nominal. Organic fabric, preferably cotton, is the material of the rectangular game canvas with dimensions of

700 mm X 1200 mm. As the usage of the game both during the daylight and dark is crucial for the ghost theme, phosphoric paint enables the readability of the printed images and texts in the dark.

“Boobox” won the Bronze Prize in 2014 under the category of "Toys, Games, and Hobbies" at "A' Design Awards," however when it comes to developing a business idea for it, we realize that it lacks any technological feature that will ensure the user attachment with today’s kids. The plan was to associate Boobox with smartphones and tablets, vital devices for the Z generation. (Fousteri, Liamadis, 2013; Wasserman, 2004; Berland & Lee, 2011). An application planned to moderate the game through instructions on the fabric canvas, edited with a bizonal playground: destination path and activity area. The collocation of the path which is designed to improve problem-solving skills such as competing children, coping with difficulties, generating solution proposals, with the activity field, designed to promote theatrical and social skills such as role-playing, improvisation, memory enhancement, imitation, creativity by giving children specific tasks, involves and offers all the entertainment needed to cheer up a party. However, the application as the game moderator ensures the continuity of amusement, which controls the going back and forth between the two fictional zones. Using smartphones or tablets instead of a parent as a moderator is another innovative game aspect. It is an essential feature that the use of tablets, sometimes criticized by parents, or even pedagogues, is used here as a moderator and used on a level that supports or even modernizes the child's social activity.

4. Objectives / Results / Conclusion

Based on the shortcomings in the toy market in Turkey, "BooBox" offers an entertaining party for the children of 6 years old plus who come together on special occasions such as playgroups, birthdays, and friends' meetings. As the primary purpose of the box game is entertaining, it succeeds in this objective by gathering educational and socializing activities and contributing to the development of children's communication and theatrical skills. More than a classic board game, Boobox helps the players improve their problem-solving skills by competing with children, challenging challenges, and producing solution proposals with the goal path. At the same time, it also offers a parallel playing field that enables the players to conduct motor activities by assigning them specific tasks that would develop their theatrical and social skills, such as role-playing, improvisation, memory enhancement, imitation, and creativity. (Bowman, 2010; Champion, 2015). If moderated by a smartphone or tablet, the game will have renewable, updatable content instead of the fixed content of classic box games due to its specialized software. Boobox, with its self-renewing nature via updates at specific intervals, guides its users to learn different content and will never lose its appeal.

Thematic birthday celebrations have recently become popular, and products have seen significant demand in this context; for instance, the increased demand for thematic party decorations proves the actuality of this demand. However, the primary need for thematic house parties is finding creative games to entertain children, and while entertaining them, educate and socialize them, improve performance and communication skills with thematic happenings or events. Boobox fulfills such needs, and due to its upgradable software support, it constantly renews itself, consequently the game experience it offers.

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ADHEREND - Research and teaching design on the integration of old and new urban spaces

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Abstract

With the continuous development of the city, the spontaneous "growth" allows old and new buildings and spaces to coexist and replace each other in the city. Urban renewal design came into being and became the glue between old and new environments. This research attempts to integrate the bottom-up and spontaneous characteristics of the city itself into the course design in the teaching of the urban renewal case study course. Through the staged teaching phases and research topics, students can go deep into the actual urban environment, actively discover problems, analyze problems, and research problems, and finally follow the specific urban renewal design.

Keywords

Adherend, New and old Urban Space, Space integration, Urban renewal, Teaching design

1. Origin of research

East China Normal University School of Design's MFA master's course "Urban Renewal Design Case Study" is a professional elective course for the first-year graduate students majoring in Environmental Art and Urban Renewal Design. Through the research and analysis of specific cases of urban renewal, students' understanding of urban design and the ability of design research are cultivated, and at the same time, they provide theoretical and technical supplements for the future professional design studios. The case study, as the core of the teaching content of this course, the origin of the research and the reference for the later urban renewal design studio, plays a very important role in the whole course. The dimensions of the case study are divided into several aspects.

Lucian Pye (1981) mentioned that "… serious analysis of nearly all of the important aspects of life in China must, eventually, confront Shanghai and its special place in the Chinese scheme of things." (p xi–xvi)

In addition to the introduction of theoretical cases in the class, the city of Shanghai is used as the starting point of the study, and urban exploration is carried out in a localized way: on the one hand, from the "top-down" perspective, conduct site exploration and investigation of urban renewal projects in Shanghai, focusing on completed cases; on the other hand, from the "bottom-up" perspective, through independent research, discover cases of urban spontaneous renewal, and analyse the spatial form and cultural living environment of urban self-formation from the theory of urban metabolism and self-organization.

Zhou, Y (2017) concludes that "In old city center neighborhoods of Shanghai, socio-demographic, cultural, and economic changes have produced and are producing new trend quarters with a vibe echoing the likes of Berlin Prenzlauer Berg or New York Williamsburg, neighborhoods known as the harbingers of the creative class. Less eye-catching and more everyday than what has often been presented as the glossy 'city on steroids,'…" (p18). Shanghai, as one of the most representative cities in China, is facing great changes, old and new spaces coexist and replace each other. In this course, we are trying to figure out where the "ADHEREND" space or environment is, how can we tackle with them, and eventually, through the research of "ADHEREND", change the landscape of urban design.

WEEK	DATE	PHASE	CONTENTS	FORM
1	11/21/2018	1	Studio Intro: Assign the PHASE 1 work, ASSIGNMENT#1:"REFERENCE STUDY"	Team work
2	11/29/2018		On-site investigation of cases in Shanghai	Field research
3	12/6/2018		ASSIGNMENT#1 review Assign ASSIGNMENT#2:"URBAN SURVEY"	Review
4	12/13/2018	2	Assign ASSIGNMENT#2:"URBAN SURVEY" desk critic	Desk critic
5	12/20/2018		Assign ASSIGNMENT#2:"URBAN SURVEY" desk critic	Desk critic
6	12/27/2018		ASSIGNMENT#2 review Assign ASSIGNMENT#3:"MAPPING & PROPOSAL"	Review
7	1/3/2019	3	Assign ASSIGNMENT#3:"MAPPING & PROPOSAL" desk critic	Desk critic
8	1/17/2019		Assign ASSIGNMENT#3:"MAPPING & PROPOSAL" desk critic	Desk critic
9	1/24/2019		Final review and presentation	Review

Fig 1. Course schedule (Author's own drawing)

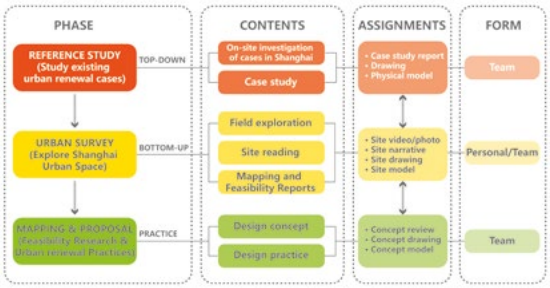

Fig 2. Structure design (Author's own drawing)

2. Introduction to the course

The course "Urban Renewal Design Case Study" has a total of 9 weeks and 36 credit hours. Since 2017, there have been 3 rounds of teaching practice. As a first-year professional elective course of the MFA program of the School of Design, East China Normal University, it is mainly aimed at students majoring in urban renewal design and environmental art. Other majors such as visual communication, public art, product design, etc. can also take inter-professional electives. The training of MFA graduate is based on project practice, combined with the characteristics of 2+2 international exchanges, and pays great attention to the exchanges between various disciplines. Therefore, based on the existing urban design major, this course has greater inclusiveness and feasibility of interdisciplinary research. The number of students in the course is generally controlled at about 20-30 people, of which students who are not majoring in urban renewal or environmental art account for about 10%. Therefore, the core content of
the course will be urban design as the main body, while integrating other design disciplines. The learning mode of subject team cooperation is carried out, and the research and inspiration of the assignments is the final output goal.

This course is an urban adventure starting in Shanghai.
What potential does our place hold? Is it possible to turn the surrounding environment into resources, sort out these abandoned, forgotten, and considered worthless buildings and spaces, and seek recognition of the chaotic and chaotic urban status quo through investigation and research? If we project "growth" to the scale of the entire city, a city cannot be "designed" completely, but can only be "evolved" for a long time. Cities and neighbourhoods have undergone repeated demolition and construction, and the appearance of space cannot retain a continuous structure. Therefore, for urban renewal, increasing the "stickiness" of space is one of the goals.

3. Teaching practice

Under the framework of the overall training plan, this course mainly has two teaching tasks:
1. Lay a theoretical and research foundation for the subsequent multiple urban renewal design practice courses.
2. Through theoretical and field research, improve the preliminary research ability and understand the basic theory of urban design and urban renewal. In the 9-week course with a total of 36 credit hours, it is divided into 3 phases according to the course content, and 3 assignments need to be completed. After each phase, there will be periodic reports and evaluations. Since 2017, this course has completed three rounds. The choice of course research sites also vary. The research site in 2017 and 2018 were students conducting field research in groups, taking "Made in Shanghai" as the research theme, and making site selections. The research sites selected in the final survey include Longchang Apartments and Mifeng Woollen Thread Factory, which focus on the renovation of old blocks and buildings; those located in dense and complex urban spaces in the city centre, such as Shanghai Audio-visual City and Tangjiawan in Jing'an District; There are a series of urban spaces, such as the reconstruction of the pedestrian passage under the elevated Gonghe New Road, the "compression passage" connecting Nanchang

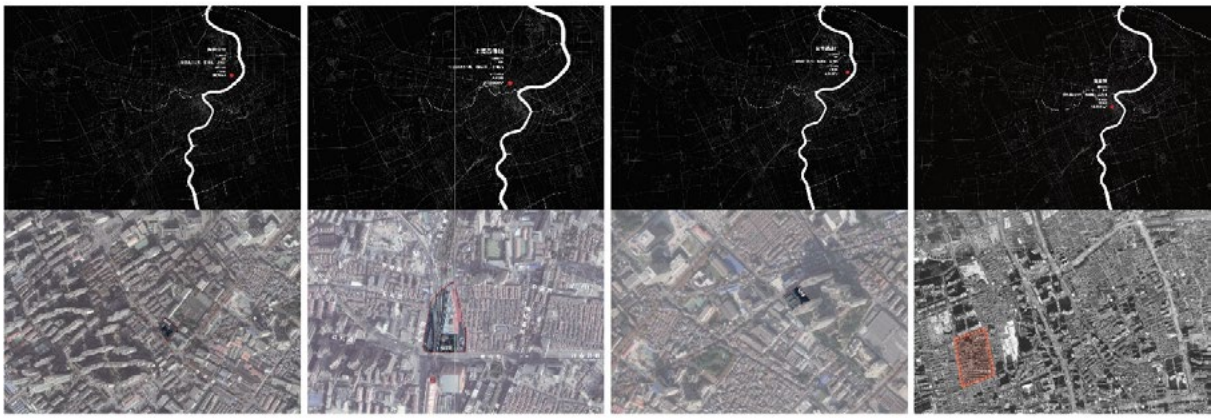

Fig 3. Research site (Assignments of “Urban Renewal Design Case Study”, 2018)

Road and Fuxing Middle Road, etc. The teaching research at this stage is to hope that students can explore and discover the neighbourhoods, buildings, and spaces they are interested in and choose them as the site for their next stage of research and design. Students are encouraged to go deep into the city, to visit, and to conduct a more subjective and critical study of urban space. The 2019 course narrowed the selection of site from the original urban scale of Shanghai to the small scale - Suzhou River Guangfu West Road section. The 16 students were divided into 6 groups, with Suzhou River as the core, and 6 sites were selected for research. The overall research will focus more on the two issues of Suzhou River management and urban public space renewal design.

- **PHASE 1: Reference Study - Study existing urban renewal cases**

In a 9-week course, the teaching of the first phase is mainly completed in the first three weeks. The main objective of this phase is to allow students to conduct research on classic urban renewal cases and master certain research methods through three weeks. The main content is divided into three parts: (1) The first is the theoretical teaching part, which is mainly about the course introduction, the teaching of urban renewal history and theory, and the research methods; (2) The second is field research. In this part, two on-site research activities are arranged. The first one is a group field trip of the whole class, which mainly selects the completed urban renewal projects such as Yangpu Riverside. The other one is based on theory lecture, students need to choose a completed urban renewal case in Shanghai (community renovation, architecture, landscape, etc.), and go to the field to do research, surveying, and mapping of this project. Through the actual space experience, to complement the practical experience that the case pictures and words cannot be replaced; finally, analysing and studying the research case through presentation, drawings, and physical models, and complete the report on the results of this phase.

The *reference study* phase is also a 'top-down' teaching process. The first is a theoretical lecture, followed by a survey of established excellent cases, all researching and learning specific design and update methodologies from an existing mature demonstration. It is also the basic preparation for future teaching.

- **PHASE 2: Urban Survey - Explore Shanghai Urban Space**

PHASE 2 starts from the fourth academic week and has a total of 3 weeks. This phase is also the core of this teaching practice. If the case study in phase 1 is a "top-down" teaching process, then *Urban Survey* is a "bottom-up" spontaneous research practice. Whether it is the intercity exploration with the theme of "Made in Shanghai" in 2017 and 2018, or the research along the Guangfu West Road section of the Suzhou River in 2019, this stage is mainly to guide students to actively go out to cities, streets, and buildings, and use their own eyes to discover sites and spaces with potential for development and design.

Fig 4. PHASE 1 Reference Study example, architecture evolution of Shanghai Modern Art Museum (Left to right, 2008, 2015, 2016 and physical study model)

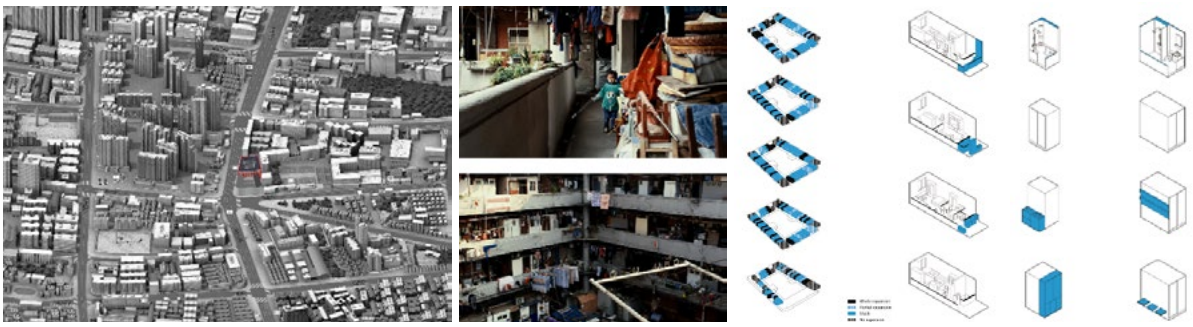

Fig 5. PHASE 2 Urban Survey example 1, LongChang Apartment (a former British police station turned into a residential complex), 2018.

Fig 6. PHASE 2 Urban Survey example 2, Shanghai Audio visual City (Mixed used market), 2018.

Urban research work starts with a few key words: they may have these spatial forms, e.g. "in-between", "by product", "grafting", "lacuna" , "gap", "crack"... These research objects with the potential of "utilizability" have a series of interesting spatial sensations, "fuzzy", "informal", "mixed", "uncertainty", "ephemeral", "accidental"...

Explore the usable space in the city of Shanghai, it may be a forgotten urban enclave, it may be a plant landscape in the cracks of the building, it may be an old historic house with unique value but ignored by modern cities...

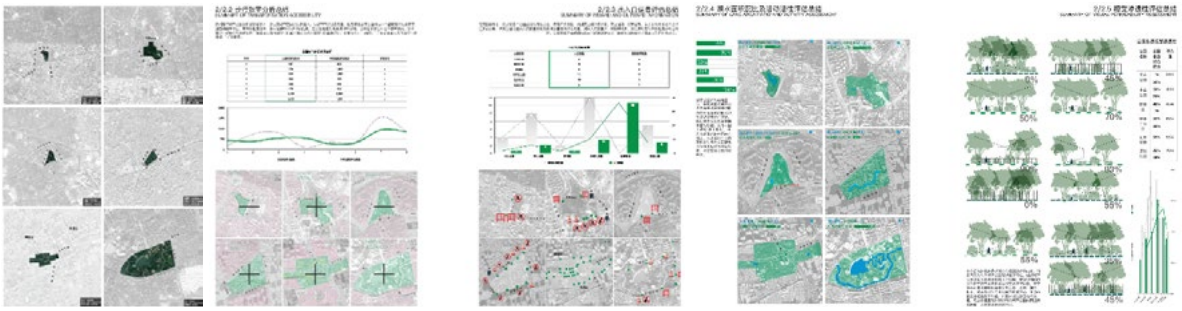

Fig 7. PHASE 3 Research, “CAVITY” Evaluation of the opening degree of urban parks in Shanghai inner ring, 2021.

Fig 8. PHASE 3 Research, “COLLAGE” The old and new relationship of the urban interface, 2021.

- **PHASE 3: Mapping & Proposal - Feasibility Research and Update Practice**

The last 3 weeks of the course go to PHASE 3: Mapping & Proposal. After the existing case study in phase 1, the spontaneous urban exploration and site investigation in phase 2, phase 3 will enter the design practice stage. The design practice will focus on concept proposal and feasibility report. Based on the previous research results and the selected sites, design propositions and concepts that meet the needs of the site are put forward.

After phase 2 Urban Survey, students found usable urban spaces, which are either forgotten or abandoned. Under the comprehensive research, the information and drawings of these spaces and urban areas have been summed up, as the basic material for the next creation. Based on these space materials, PHASE 3: Mapping & Proposal will propose design and improvement plans in groups, and with logical design analysis and research. Take 2021 academic year students` research assignments as examples: the first one is based on topic “CAVITY”, which is the Evaluation of the opening degree of urban parks in Shanghai inner ring; the second research topic is “COLLAGE”, which is studying the old and new relationship of the urban interface. Through these different research topics and creative design analysis, we try to explore the new methods for Shanghai urban renewal practices and to promote the metabolism of the city.

4. Conclusions

The objectives of the assignments are also the course objectives. The assessment criteria revolves around two parts:

First, it is the quality of the completed work, which is also the core of the assessment of this course. Each phase of work will be graded individually according to the established scale, and the final total will be the final grade. The focus of the assessment is (1) the "research" of the design, that is, whether students can think critically in the process of research and design practice; (2) the "integrity" of the content, that is, whether they have the ability to think about research and design practices. The in-depth ability of design, including the completion and in-depth degree of reports, drawings, models, etc.

Secondly, it is design expression and course participation. As a course with small groups as the main

form, teamwork ability and work coordination are also one of the evaluation criteria for this assessment. At the same time, how to explain the research and design results fully and logically in class discussions and commenting on pictures, and how to enrich the presentation forms of reporting and presentation are also important assessment contents.

The development of the city is dynamic, and the old and new buildings and spaces will always undergo a constant metabolism in the city. For the course "Urban Renewal Design Case Study", how to integrate students into the changing city through a more research and practical method is one of the focuses of this course. Not only that, social life and design activities are also intertwined, and good design practice must come from life and ultimately serve life. Therefore, this course starts with theory, starts from cases, gradually breaks the boundaries, and walks out of the classroom, allowing students to spontaneously integrate into the city. With a certain theoretical foundation, from the perspective of architecture and urban renewal, re-examine and study the urban spaces in which we live every day.

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Sustainability in the 3D printing of housing and settlements co-design processes

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Abstract

The current narration of the world's events recalls us, once more, that the phenomenon of migration is one of the ones earmarked to change regularly human geography under the weight of human communities' (re-) placement and (re-)distribution on the territories, repeatedly, due to continuous globally spread "emergency states". Earthquakes, tsunamis, pandemics, poverty, lack of basic need provisions, and wars - with the related humanitarian crisis and consequential refugee migrations - raise their common topic once more: the need for effective answers for emergency housing to this old and never-ending happening. In such conditions, one of the first and urgent issues to answer is the housing emergency, in pair with the need for cheapness and rapidity (in implementations) and flexibility and co-designing (in adaptations). Apart from the relevance of the reasons that drive these global complex movements, it is undoubted there is a matter to consider the effects it is having on the designing codes and their innovation, at all design scales. The actual fourth industrial revolution is widening our potentialities in that. The improvement of the 3D printing tools and supplies, together with the growing opportunities to print even bigger "objects" - until the printing of entire houses fully furnished - is opening interesting new rooms, never thinkable prior. These opportunities mark an innovative track for design, as well as a suitable pathway in case of different emergencies, from natural to human-made ones. Starting by analyzing the current state of the art in 3D printing and a real Pilot case in Italy, this paper aims to show nowadays we are allowed in thinking of cheaper, faster, local-based, flexible, cyclical, and real-time implementable processes, through real sustainable participatory co-designing actions.

Keywords

3d Printing Houses, Co-design, Participatory-Design, Fourth Industrial Revolution, Cyclical approach.

1. Introduction

The whole world is experiencing a constant growth of both regular and irregular migrant flows from year to year. Some border countries are overwhelmed by an extensive number of asylum seekers (Barslund et al., 2019) who have an urgent need for immediate (just-on-time) shelter (Fargues, 2017). This massive number of migrants raises the question of how to deal with the emergence of housing when first aid and reception centres are full or have a very limited size. Nowadays, it is already possible to provide temporary or even definitive settlement solutions thanks to the technological innovations made available in the fourth industrial revolution: 3D printers and robotics (Dunn, 2012). This paper intends to provide an update on the actual state of the arts in the 3D printed units resources, as well as to introduce local-materials-based and flexible solutions for the diverse dwellings' needs, through sheltering structures for cheap emergency housing, printed in the place, and in a short time [Figure 1].
The study proposes a 3D Pilot that for several reasons, especially related to emergency challenges, can be realized in a very short time (until 48 hours per unit), low costs, and with several grades of flexibility and performance in both designing and implementing. The research conducted on the examination of additive, extrusive 3D printing was also heading towards the use of alternative materials (preferably local), sustainable construction processes and innovative settlements configuration, aimed to reduce

Fig 1. Current samples of 3D printed houses. 1) New Story housing in Mexico (Source: Zdanowicz, 2019); 2) Single-family house in Beckum (Source: Woehl, 2021); 3) Micro home in Amsterdam (Source: Frearson, 2021); 4) Tecla house (Source: Parkes, 2021); 5) 3D printed house in Texas (Source: Englefield, 2021); 6) 37m2 house in Russia (Source: Grašytė, 2021); 7) 3D printed house in Eindhoven (Source: Parkes, 2021); 8) Casa Covida (Source: Block, 2021); and 9) two-story building in Dubai (Source: Block, 2022).

the environmental impact and achieve greater circularity in the construction process – i.e., through the reuse and recycling of waste materials - at both the architectural and settlement scale.
It is shaped, then, a possible innovating trajectory in both the architectural-engineering field and in the urban, social, and economic spheres, because emergency housing for people in need developed with 3D printers and robotics would be able to mitigate the unexpected housing requests in a very short time, and through an integrated and shared process - therefore participated. A renewed process able to put design culture back at the forefront in the intelligent use of new digital manufacturing technologies, leading to new smart-design languages, and new ways of participating in co-designing, by involving the final users according to their own cultures as well as their own specific needs, since the first stages of designing and in real-time.

2. Emergency, sustainability, and co-Designing

In 2015 the United Nations established the 2030 Agenda for Sustainable Development, which was articulated into 17 Goals (SDGs). The 17th Sustainable Development Goal addresses the problem of the future cities and establishes an aim to make them more inclusive, resilient, safe, and sustainable (United Nations, 2015). Then, according to the further UN Goal 11th, architecture designs and migration flows may influence each other in many ways.
Because of several current innovations, in terms of both new codes and new technologies in design, it is possible to think of interacting with new and suddenly needs by temporarily/permanently hosting massive migration emergencies, even those coming from very different cultural and social identities, through a quick implementation of in-real-time new printed houses. Also, it becomes possible to shape new settlement programs accorded - and suitable - with the coming peoples' - sometimes intense - diversities; guaranteeing resilience in short-term, long-term sustainability, and more inclusive housing

Fig 2. From micro to macro. Left: house's furniture Bilbo, a modular lamp made by Caracol Studio (Source: issuu.com). Right: new settlement for a smart, green, and sustainable residential cluster through 3D-printed houses, implemented in South Africa (Source: businesstech.co.za).

as they may be influenced by diverse migrants' cultural identities and needs since the first stage of designing, by acting through a co-designing process and by involving the new users in a participatory design. (Beisi, 1995). Indeed, even provisional hosting settlements could and should be inclusive, safe, resilient, flexible (Das and Shahriyar Parvez, 2021), and sustainable, which requires considering also cultural/social "differences", among the other conventional parameters such as quantity, quality, times, and costs of construction. Proposing possible "tailored" answers is given to us by 3D printing nowadays. 3D printing makes indeed already possible - according to the actual state of arts in 3D technologies - fast solutions in about 48h per house (that can easily become 24h in series production); high-quality productions provided with good isolation, good finishing and personalized interiors and furniture, printed in the place together with the house's main body; a satisfactory match between the hosting needs and the peculiar kaleidoscopic habits of migrants; and also allows using in-the-place low-cost materials (both raw materials, as well as waste materials) with zero km of transportation, sensibly reducing times and costs of construction. Dwelling units can approximate both native settlement rules and vernacular houses typologies [Figure 2, right], which helps to reach a supportive "feel-at-home" sentiment for both refugees and migrants. As we said, 3D printing technology can also be used to furnish homes, making them ready-to-use but not necessarily "standardized".
It is possible, then, to build a full process from the smaller scale (furniture) to the larger one (settlements), able to release a multi-answer to the various diverse needs and origins' habitats (Watson et Al., 2019). Caracol Studio, based in Italy, is the partner company representing the meeting point among three different worlds: Design, Engineering and Digital Fabrication. It produces numerous examples of furniture and furnishing accessories using 3D printing technology, such as the modular Bilbo lamp made with waste materials from plastic [Figure 2, left], as well as it is now challenging with the 3D printing of houses.

3. 3D printing of large-scale structures

3D printing techniques, which also can be called "Rapid Prototyping", were offered for commercial use in the 1980s (Watson et Al., 2019). 3D printing is an additive process of production of three-dimensional objects by consequent overlapping of two-dimensional layers. The printing model is sliced into a series of thin layers, which thickness is determined by the type of the 3d printer, the material used, and the required precision of the printed object. The early technique, the Stereolithography, required the use of liquid polymers as the material but, later on, several new technologies were developed, and different other materials became available, such as solidified melted plastic and melted thermoplastic wax, clay, metal powder, gypsum, or concrete. The technology of 3D printing is rapidly developing, including the exploration of new materials, the creation of new robots for printing, and then the increase in the size of 3d printed objects.
There are three main methods of production of large-scale objects, such as low story buildings and

pavilions; they are the gantry system, the robotic arm, and the cable-driven systems (CPT, 2022). Each of the methods has its advantages and limits. The gantry system requires building on-site, the production machine allows moving the nozzle in X, Y and Z directions following the fixed frames. In the cable-driven system, some frames are replaced by cables, which helps to make the whole system more lightweight and easily transportable. The robotic arm has more freedom of movement as the nozzle can be moved along a 6-axis system, but it has greater limits in the size of the printed object since it is limited by the length of the arm. The demand for sustainable concrete 3D printing in the construction industry is constantly increasing, which pushes forward the research for new building methods and appropriate housing designs. 3D printed houses in comparison with the conventionally built ones have the advantages such as lower costs of construction and materials transportation; higher level of sustainability and reduced embodied energy; reduced material waste; significantly reduced construction time and lower demand for the onsite workers (Hager, Golonka and Putanowicz, 2016). Housing typologies vary from the very minimal shelter or hut, resembling the traditional primitive dwellings, to the advanced contemporary-looking units. For the buildings constructed using the 3D printer with a fixed location, the area starts from 8 m2, for the smallest cabin, and reaches 94 m2, which is the size of the standard social unit. Figure 1 (above) shows some examples of 3D printed residential units. As an example, the house in Eindhoven [7] was assembled using the 24 components which were produced at the factory and transported on-site. As an exception, the largest 3D printed building in the world, the 3D printed building in Dubai [9] has an area of 640 m2. In this case, the building was produced part by part, and the robotic arm was constantly relocated. Construction materials vary from bioplastic, clay, sand, silt, concrete, and reinforced concrete. Large scale buildings require using some additional elements and materials, such as precast panels, metal wires, wooden carcass, etc., while the small units can be produced using the same material which can be locally sourced. The average time of construction is 5-9 days for the big unit, but at the same time, the smallest shelter can be built within 24 hours. The majority of cases are one floor and one family houses, however, some advanced technologies, such as Contour Crafting, allow to increase the building size and automate almost all the processes of building fabrication, including the plumbing, electrical wiring, floor and ceiling tiling, insulation, painting, finishing, and embedding of the sensors (Khoshnevis and Kazemian, 2020).

4 A proposal for 3D concrete printed housing unit

The case study we investigated for this research is a test for a 3D printed house with the ambition to be fully sustainable, from adopted building materials to energy highest efficiency, named “Gaia”. This research has also been possible thanks to the collaboration with RiceHouse.
The first 3D printed earth-house [Figure 3, right], was presented in September 2018 at the “Villaggio a Shamballa” Exhibition in Massa Lombarda, Ravenna, Italy. This represents the first architectural unit ever realized with the 3D print technology Crane WASP (Chiusoli, 2018) using 0-km clay-earth and rice waste, like straw or husk. The user removes the support material, and the piece is ready-made for use. Gaia - whose name is due to the use of raw soil as the main binder of the constituent mixture - can be considered an innovative eco-sustainable architectural model, with that particular attention paid to the use of natural waste materials from the rice production chain, it is oriented to the construction of a particularly efficient masonry from both a bioclimatic and healthy aspects. Gaia is then a highly performing module, both in terms of energy and indoor health, and next to a zero environmental impact. Printed in a few weeks, thanks to the chosen masonry technique, it does not need a heating or air conditioning system, as it maintains a mild and comfortable temperature inside, both in winter and summer. For the realization of Gaia, RiceHouse supplied the vegetable fibers that, through WASP, have been developed in a mixture composed of:

- 25% of soil taken from the site (30% clay, 40% silt, and 30% sand)
- 40% of straw chopped rice
- 25% of rice husk
- 10% of hydraulic lime.

The external case [Figure 3, left] is entirely 3D printed on the site, through the Crane WASP, and has been designed, since the beginning, to integrate natural ventilation and thermo-acoustic insulation systems in only one solution. The sedimentation of the printing material - based on raw earth, straw, and rice husk - is controlled through articulated weaves able to confer, at the same time, constructive

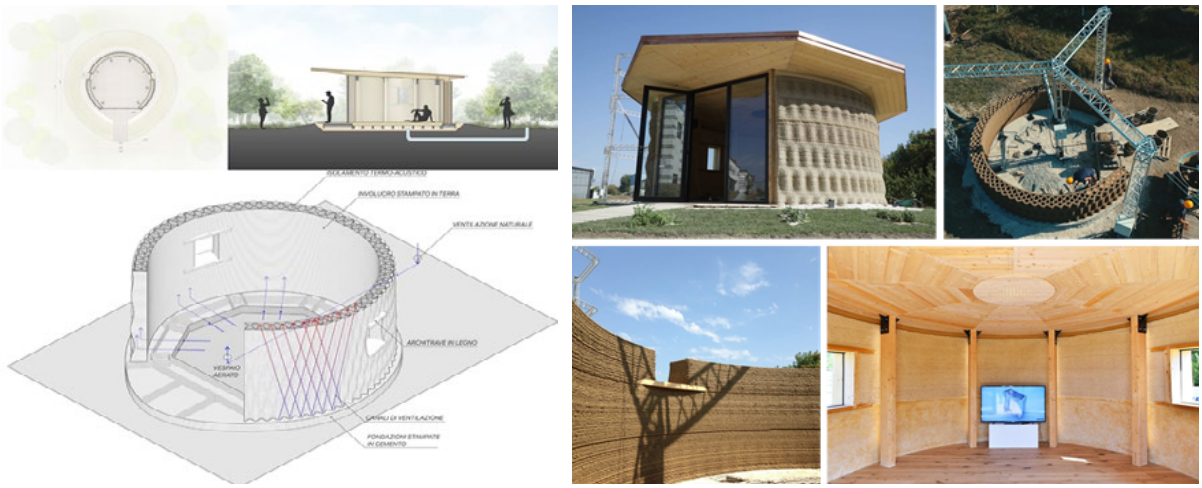

Fig. 3. Design drawings (left) and implementation process (right) of the Gaia House. (Source: www.3dwasp.com).

solidity, and geometric variation alongside the entire wall development. The versatility of the computational design is made possible in the construction practice thanks to the precision and speed of the 3D technology, easily obtaining complex geometries, which would be difficult to replicate with the traditional construction systems. It took 10 days for the realization of the 3d printed casing, for a total of 30 square meters and with a wall thickness of 40 cm; the total cost of the materials used in the wall structure was around € 900.00. The construction times are -obviously- related to the type of material that is going to be used. By using the mixture of raw earth and straw it is possible to extrude at a speed of 4200 mm/min, and with a maximum height of 300 mm in 24h, which allows the full drying of the material. These choices allowed us to print a wall consisting of 7 layers per 2.70 m high in 100 hours, for a total of 22 km of the total route. By simplifying the geometry, it is possible to reduce printing times to reach the desired height, but this did not coincide with our goal to obtain high-performance walls. If any intend to use cement-based mixtures, or in any case utilizes materials requiring chemical reactions that have a rapid change in state (from liquid to solid), it is possible to increase the progress speed in height, reaching a limit of 150 mm/h. The printer speed of movement is instead related to the fluidity of the material, with well-calibrated materials, it is possible to reach 6000 mm/min. That is, in 48 hours you can get a finished accommodation complete with accessories. The cost depends on the materials, but the estimated cost for a complete accommodation is around 10,000.00 euros for 50 m2 of covered surface.

5. Conclusion

Within the Mediterranean Basin, migrations have been a regular event since the early of our civilizations. As well as population movements have been a phenomenon even within or toward other geographical contexts. Eased by the rising of both physical and virtual "connections", during the last decades, the world is experiencing a further constant growing flow of migrants moving for many different "natural" and "human" causes. As a result of this, worldwide countries seem unprepared -and often improvised- to this huge challenge, due to the massive number of people migrating versus the endemic lack of suitable and capable facilities to host those migrants' flows. On another hand, the growth opportunities coming from the technological innovation in this 4th industrial revolution in the digital age seem to represent a set of new solutions useful to short times, cut costs, and produce more sustainable answers, often tailored to the diversity of contexts and people. With this early research that entangles a multiscale approach -from industrial design to the urban scenario- we tried to make a match between those two main facts, by providing a possible fitting solution through the 3D printing evolution at a greater scale object. New 3D printing technology, indeed, can give a solution to this problem, as we tried to demonstrate in this short text, not only in terms of "reductions" and "simplifications" as in the whole conventional process, but innovating it in terms of exploitation of the even poor but local materials; in-

the-real-time co-designing, together with the next-users, of more fitting the customary inhabitants' habits houses and settlements; final production of "culturally-tailored" neighbourhoods, houses and interiors. Nowadays, the maximum sizes of the 3D printed houses are limited yet and, as raised from some of showed case studies, it still works the best with the small-size and simply shaped shelters. Nowadays, the new cable-driven 3D printers are capable to provide better solutions exactly on this track. They can be easily installed and may benefit from the use of locally sourced simple materials, such as clay, straw, and sand. The total price of the building is relatively low, due to the reduction in procurement and transportation costs. Also, the smallest house can be completed within one or two days, which also means that it can deliver an immediate response to the many sudden flows of migrants needing shelters in a very short time because of any emergency event. Furthermore, since local raw or recycled materials are used, the house can be very easily deconstructed, and materials largely reused; in such a way reducing along time the environmental impact, guaranteeing instead a full circularity of materials and processes. As said, the sustainable impact of 3D printing so includes the use of locally sourced materials, great flexibility of the construction and the possibility of its fast deconstruction and materials reuse. In a real case emergency, also, the 3D printing technology allows selecting the building typology based on the ready 3D models, so to release a fast answer and not require additional labor since all the construction process is automated. Indeed, on-site manufacturing using digital fabrication systems, and the wide range of 3D modelled house typologies might be an innovative solution for the accommodation of people in emergencies, meanwhile, its extreme flexibility can give them an additional opportunity to interact with co-design processes in culture-based personalization. The intrinsic peculiarity that characterizes 3D printing is that it allows fascinating growth. An enigmatic and mystical ability that involves and stimulates to continue investigating it and to discover its potential, while simultaneously overpassing its current limits.

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A renewed poetic practice. Rethinking the role of packaging design to boost New Normality

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Abstract

Packaging is a complex artifact characterized by the subtle balance between safety, protection, innovation, communication, and sustainability. There are different perspectives from which this artifact can and must be considered, first of all, the traditional meaning that considers it an object with specific operational and performance features.
From these brief premises, this contribution stems from a reflection of the controversial relationship between form and function, investigating the contemporary need - New Normal - to totally rethink action-research and design practice, in favour of a more communicative, experiential, and poetic design. A design that today must also take advantage of technology and digital resilience to pro-actively respond to the emergency.

Keywords

Packaging, Design, Technology, Poetics, New Normal

1. Introduction and scenario

Whether it is definitively the so-called New Normal, we still cannot know.
The complex contemporary scenario has distinguished a packaging sector particularly prone to growth and innovation; particularly resilient especially given the recent regulatory updates relating to the introduction of specific environmental labels, or given the new environmental investments through so-called corrective taxes. Among the key points of the discussion, then, we must mention a specific attention for the conversion of the economy in a more circular sense - green economy - taken as a supporting objective, to be translated into a skillful mix of provisions regarding the availability of necessary resources and infrastructures, incentives and measures to contribute to the reduction of pollution of the terrestrial and marine environment, and last but not least, all the strategies and action lines on social inclusion and accessibility policies starting from an intersectoral approach.
At the same time, statistical surveys qualify the packaging artifact - from the point of view of the final consumer - one of the discriminating factors when purchasing a product, to the point that approximately 60% of Italians will increase the choice of products with sustainable packaging and 28% believes it is necessary to have devices capable of informing oneself correctly and changing daily consumption habits in a greener perspective. This is because, the post-lockdown consumers are already recalibrating their lifestyle, requiring that most of the services of the pandemic era become - officially and definitively - the new normal (Nomisma 2021).

Fig 1. Black-figured amphoras (The British Museum, 2022)

2. Form and function: a controversial relationship

At this point, the question arises spontaneously. The sector in question has shown to own a particularly proactive attitude and thus be able to deal with global restrictions and difficulties that go beyond the design of a simple container. This sector has seen and often has been able to manage the opening to unprecedented opportunities, in the direction of a new literacy that is involving the entire packaging sector as well as the role of the project in the strict sense. But in the new normality, is the concept and the intrinsic meaning of the packaging function (Ciravegna, 2010) - in its most traditional sense - still a value that can distinguish us, as designers? Isn't it outdated, as it is anachronistic, to consider packaging as an operational aid in the first place? Wouldn't it simply be unusual to buy or receive a packaging not able to contain?

The controversial relationship between form and function, between content and container, is very ancient history. There are actually many cases in which the packaging has failed, for one reason or another, to perform its primary functions, namely those of protecting, maintaining, and containing. One among them is the striking case of the Franklin expedition. We are in 1845 when the British officer J. Franklin started the expedition aimed at discovering the controversial north-west passage. Two ships, Erebus and Terror. Two sturdy, well-equipped, state-of-the-art ships. Inside there was canned food sufficient for years, and for all the crew. The decision to supply the ships from a discounted supplier, however, was fatal. The more than eight thousand packs ordered were sealed with lead solder, solder later defined as "crude and coarse", to the point that some of the lead-contaminated the food, causing illness and death of practically all the crew. Little is known about the two ships, or rather the disappearance of the Franklin expedition. However, much richer is the scenario that has seen – over the centuries - poetic performance as an element, perhaps an anthropological tool, fundamental to living and habit. Think of the vases of ancient Greece: they were designed to narrate the myths of the gods, to bring people together - through the spontaneity of religious sentiment. Only later they were used to safely store the olives [fig. 1]. This contribution - based on concrete practices and best practices - is

Fig 2. Her / She campaign for International Women's Day (BETC Sao Paolo Agency, 2021)

proposed as a reflection and review - in a broad sense - of the Sullivanian legacy, highlighting the contemporary need to rethink the overall practice of the project, in favor of a more - however not exclusively - poetic, experiential and technological design. A conversion in favor and also in support of the emergency.

3. A renewed and technological poetic practice

But what does it mean to reconsider the continuous research and above all the design practice towards the exploration of what we can define the new forms of technological poetry?
Thus we come to talk, in the setting of the New European Bauhaus (NEB), of exploration in the field of storytelling and historytelling, research of social impact, qualification of new ways of interaction and augmented reality, of multiverse and creativity. Furthermore, of the birth of e-commerce services increasingly oriented to the final consumer, simple and at the same time experiential (from social commerce to voice shopping, to name a few), of the importance of traceability in terms of accessibility, authenticity, and safety, and the upstream application of the design of the Sustainable Development Goals (SDGs) (Shopify, 2022). Recalling that what has really changed today is the level of consumer expectations; increasingly critical, demanding and resilient consumers, who will ask for sustainable experiences and artefIcts no longer as a passing phenomenon, but as a basic rule. As a convention (Bucchietti, 2020).
From these opportunities, the packaging sector today finds itself appealing to the intrinsic and characterizing capacity of digital and environmental resilience on the one hand, and of the "new normal customers" on the other, qualifying a systemic approach applied to sustainable innovation which sees the new technological possibilities as a fundamental design input. Hence the importance of a "naturally" qualitative output; an output that finds its answer in the creative capacity as an aid to enable new

Fig 3. Sustainable Sports Drinks and packaging with integrated AR experience (Barcode, 2022)

educational practices, tangible and shared. Practices fundamental to inclusion as opposed to exclusion, in favour of uniqueness in response to diversity [fig. 2]. Practices helpful to create a sense of belonging, to create community [fig. 3].

4. Conclusion

In conclusion, taking up what was stated in the book ”La costruzione dell’interazione: il ruolo della narrazione nel processo dell'interaction design” (The construction of interaction: the role of narration in the process of interaction design): "The process of construction of the interaction is based on a relationship capable of understanding the needs of the person and the implications of the use of technologies, opens the way to a visible narrative that becomes an integral part not only of the use but of the very relationship that is established with artifacts and services" (Di Salvo, 2020).
In this scenario, design is proposed as a flexible and dynamic tool for interpreting the transformations of today's society and today social challenges: cultural value, a tool for enhancing skills, a mediator of needs, a tool for always tracing new routes in terms of sustainable innovation, inclusion and accessibility. Still, a tool for exploring new contexts and for reading social and cultural changes (Germak, 2008). A design capable of renewing the value of human connections as a primary need for people in the New Normal. As a tool and method to bring the person back to the center of design practice - also - through technology. Still, as a process mediator, able to use technology to democratize the project - the packaging - and to establish value creation processes based on aggregative dynamics (Ranzo & al., 2017).
We thus speak of a renewed centrality of human beings enclosed in the assumptions of digital humanism, as the only and discriminating way to qualify the transdisciplinary approach useful for facing the challenges that this historical moment presents to us. A way to re-embrace a design process in the context of – once again – poetic packaging.

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Collaborative services as trigger for a sustainable culture: two case studies

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Abstract

The paper proposes a research carried out in the field of Service Design for Collaborative Services, through the development of two university research projects and with the aim of advancing the sustainable culture. Nowadays collaborative and peer-to-peer systems are facilitated by the democratisation of technologies, therefore, the research investigated the opportunities of those systems to provide the empowerment of their users, in terms of green, soft and hard skills, and achieve a sustainable emancipation from the bottom. In this dimension, is emerging the capability of Service Design to activate inedit connections and provide new collaborative and sustainable networks. Two collaborative platform projects are here presented: Make!T Different and Restart. The first enables the use of environmental assessment tools in the context of non-expert design, while the second promotes social sustainability in the creation of social and solidarity-based enterprises in the Maghreb region.

Keywords

Collaborative Platforms, Sustainable Empowerment, Life Cycle Assessment, Inclusive co-creation, Social Innovation.

1. Introduction

The persistence of current social, climatic and economic problems highlights the need to spread collective awareness on which to create the basis for a sustainable emancipation of our society. The direction here investigated to pursue this emancipation is identified with the tools implemented through Service Design and resulting in Collaborative platforms.

Service Design for Collaborative Service represents a compass to identify and satisfy new needs of the community and thus enabling social innovation: “social innovations are new solutions (products, services, models, markets, processes, etc.) capable of satisfying a social need (more effectively than existing solutions) through new (or improved) relationships and the innovative exploitation of goods and resources” (Caulier-Grice et al., 2012, p. 18).

In this perspective, design emphasises the solutions generated within society itself and supports them by offering tools to support innovation processes. Design analyses bottom-up phenomena that can be catalysts for sustainable cultural innovation through technological innovation.

The spread of participatory and collaborative systems, where consumers/users take on new roles, including that of producers of content, highlights an increasing willingness to play an active role within the supply chain and service systems, which gives rise to the concept of the *prosumer* (Toffler, 1980), a figure who can now act as a bridge for the dissemination of knowledge and sustainable practices, becoming a sort of ambassador or influencer.

2. Sustainability of p2p system

With the pervasive diffusion of digital devices in recent decades, we are witnessing a transformation of production and communication systems, which is pushing for a change in the relationship between producers, consumers and designers.
ICT, Information Communication Technologies, emerge as enabling solutions that facilitate social innovations from the grass-roots, fostering services in which end users collaborate with each other to implement solutions to their unsatisfied needs, and in these alternative solutions they lead towards a transition to a sustainable society (Meroni et al., 2007).
These bottom-up phenomena, which are driven by the democratisation of new technologies, are often supported by *commons-based* and *peer2peer* systems. These systems present themselves as suitable frameworks for new sustainable production and organisational models, in which prevail the needs of civil society, resulting in a democratisation of resources and profits (Bauwens et al, 2012).
The Collaborative Platform, based on p2p systems, differs from other services since they require the development of relational qualities as a prerequisite for their performance. It is necessary to create bonds of trust, intimacy, friendship and a common identity among participants, in order to guarantee relational qualities as expressions of “genuine dialogue” (Cipolla et al. 2009). This condition guarantees the service's long-term durability, since the strong relationships between users ensures a platform self-sufficiency that is a measure of sustainability.

3. Distilling complexity

Roberta Tassi defines Service Design as a “direction of directions” since it is able to orchestrate the multiplicity of specific languages of all the spheres involved in the realisation of a service project (Roberta Tassi, 2019). Generating a sharing of values among the actors involved creates a design ecosystem in which designers, through a systemic approach, collaborate on a forward-looking vision that does not presume to completely solve a complex challenge, but lays the foundations to create new open questions.
In the research projects presented, it is emphasised how the use of tools such as the *Systemic Design Framework* [fig. 1], a design model reworked by the Design Council in 2021, on the basis of the *Double-Diamond*, succeeds in “Distilling complexity & providing space for different expertise” (Drew, 2022), favouring the emergence of bottom-up solutions that produce inclusivity and social innovation.
The design of collaborative platforms brings out the need to work on a horizontal dimension with the aim of creating relationships, ties, community, trust (Cannonieri, 2018). The success of these systems is gained by considering the needs of the community that first participates in the activation of design choices and development processes in a logic of sharing and value creation (Maiolini R., Fracassi E., 2015).

4. Restart platform

The collaborative platform *Restart* was developed by the DIDA research team in the framework of two projects RESTART Tunisia - Ecological and Social Upgrading of Territories through the Relaunch of Youth Entrepreneurship in Tunisia, co-financed by the Italian Agency for Development Cooperation (AICS), and RESTART Maghreb - Tunisia, Morocco and Algeria - under the scientific coordination of XXXX - Architecture Department of University of Florence, and realised in partnership with COSPE (leader) together with other Italian and Maghrebian NGOs.
The collaborative platform (http://restartmaghreb.org/home) offers an ecosystem of services for the accompaniment of enterprises operating in the field of Social and Solidarity Economies (SSE) and promotes economic, durable, sustainable and inclusive development in the Maghreb territories. In particular, the platform promotes the employment of young people through the consolidation and start-up of enterprises for the enhancement and redevelopment of the territory.
The platform focuses on three main axes creating services for: training, coaching management and a "social showcase" for businesses. In particular, the platform promotes the employment of young people through the consolidation and start-up of enterprises, acting as tool to foster connections between start-ups, research and training centres, local NGOs and associations, institutions, incubators and

consultants, to generate a favourable ecosystem for the new businesses in order to enhance and redevelop the territory. Moreover, the platform is now developing a system of certification of specific skills for SSEs.
The interdisciplinary approach of the project has highlighted the complexity and instability of the relationships on which this system is currently based. Then two design methodologies were applied: participatory process of Service Design, to generate value for all stakeholders, and the strategic methodologies of the *Systemic Design Framework* to define a shared vision to respond to the complex challenges of the project [fig. 2].
Stakeholders actively participated in designing the service and testing the platform, inducing themselves needs and solutions that are valuable and sustainable for the community. The synergies created between institutions and local communities ensured a democratisation of opportunities in a context of economic and social marginalisation.
The project demonstrated the potential of the social and solidarity economy as a viable alternative for the empowerment of young people. Through the enhancement of transversal competences the target group gained self-awareness in the society, secured decent work and improved their socio-economic conditions.

5. Make!T different platform

Make!T Different is a collaborative platform designed to increase users' green skills through an empowerment mechanism that provides tools to assess environmental impacts on the basis of the Life Cycle Assessment methodology, tools to promote sustainable design and tools to create a local circular network.
The project, developed within the framework of PhD research, starts from the assumption that the achievement of sustainable innovation can only take place in conjunction with the achievement of sustainable emancipation at every level of our society. This level can be achieved with the active empowerment of individual citizens, i.e. by enabling non-expert people as well with the tools for the assessment and thus understanding of both environmental and social impacts.
Goal of the platform is to guide towards the eco-alphabetisation (Capra, 1982) by focusing on a defined target group of craft and DIY-people, the work was approached on two fronts.
Firstly, working on the simplification of the tools and language adopted by the Life Cycle Assessment methodology and, secondly, on the construction of a circular value network linked to the material and immaterial resources belonging to the territory that would support the platform's offer and make it self-sufficient in the long term.
In particular, the model of the collaborative platform was considered the most suitable for the following reasons: it allows the stakeholders to take on new roles within the supply chain, so allowing them to experiment with new circular network configurations; it guarantees an active involvement of users, through the creation of contents and interaction between can be generate the “genuine dialogue”; it allows the generation of new results, enabling the platform itself to adapt and accommodate the directions/needs of the users [fig. 3].

6. Conclusion

The two projects verified the possibility for Service Design to apply collaborative platforms as an enabling tool to achieve social and sustainable innovation goals. Collaborative platforms turned out to be the appropriate tool since its participatory nature allows users to increase their *empowerment* as well as to increase the offer of the platform itself by adapting it to their needs. In both projects, users experience the platform to improve their personal skills and generate social innovation. In *Make!T Different*, users discover sustainability issues through practical empowerment actions that put them in a position to be initiators of a local circular network. In the case of the *Restart* platform, users are offered tools to improve their skills and thereby their socio-economic conditions, creating a bottom-up chain for the creation of eco-friendly enterprises.

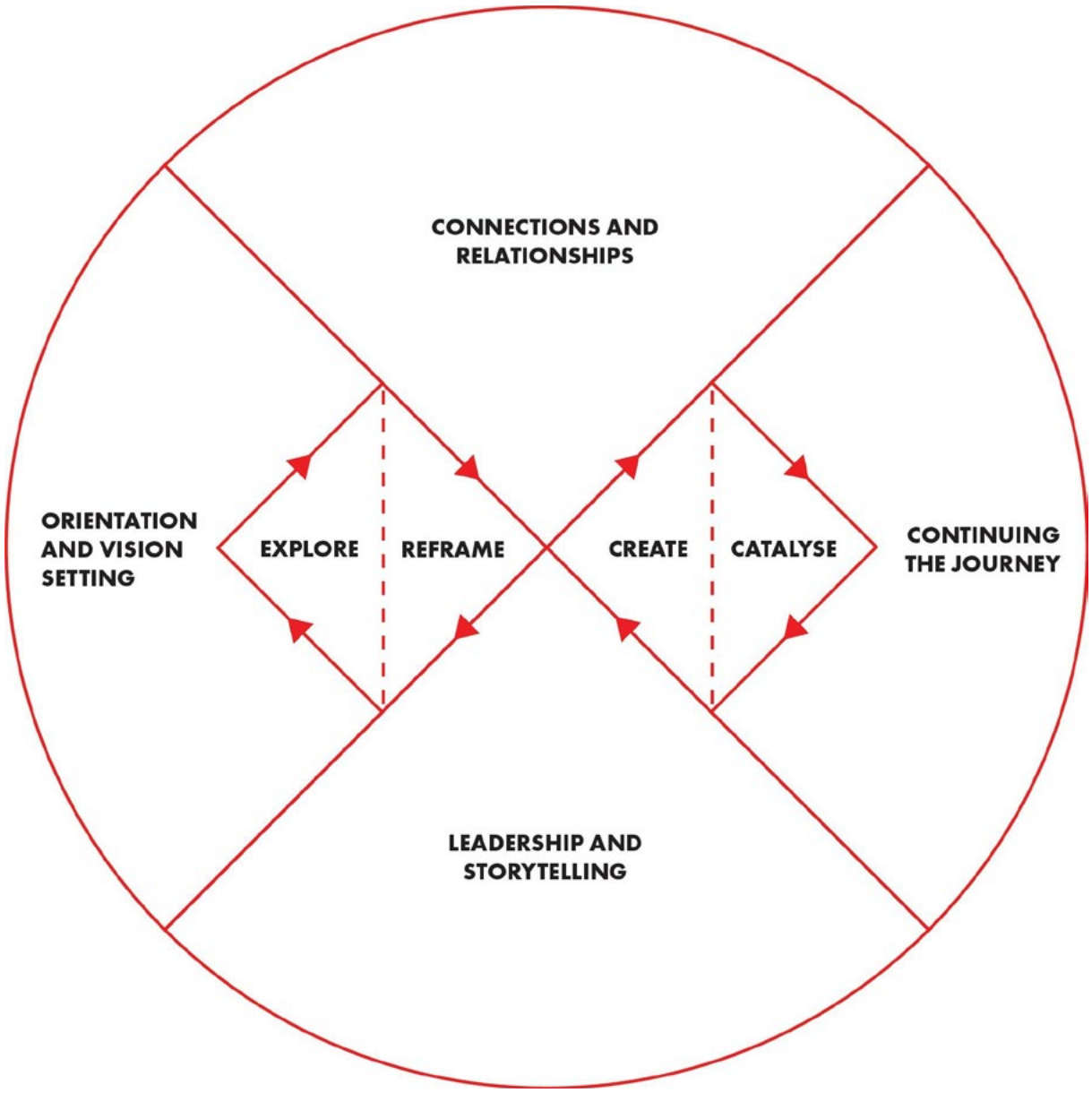

Fig 1. *Systemic Design Framework* (BEYOND NET ZERO: A SYSTEMIC DESIGN APPROACH, Design Council, April 2021)

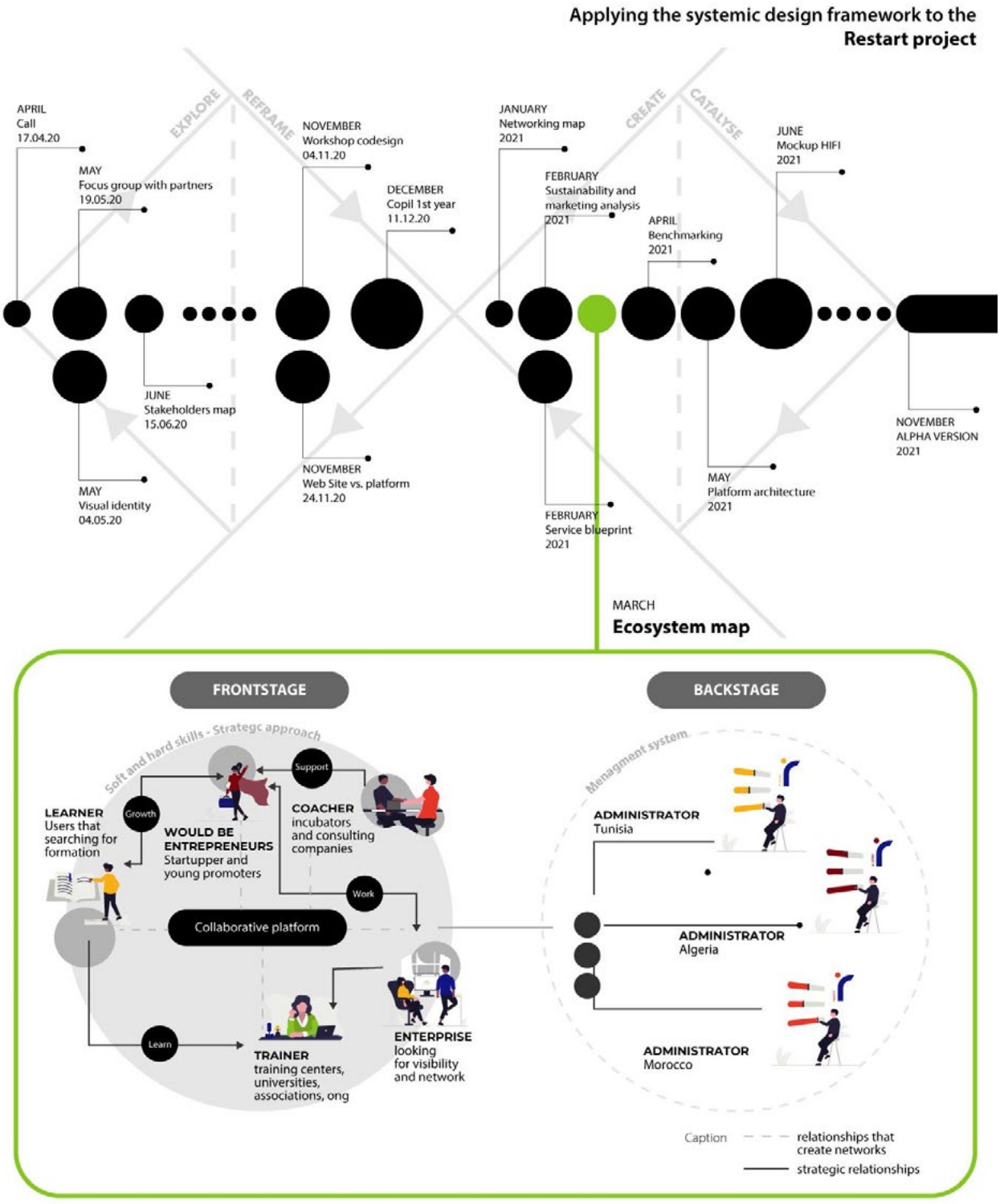

Fig 2. Systemic design framework and Ecosystem Map of *Restart project* (Dida Team, March 2022)

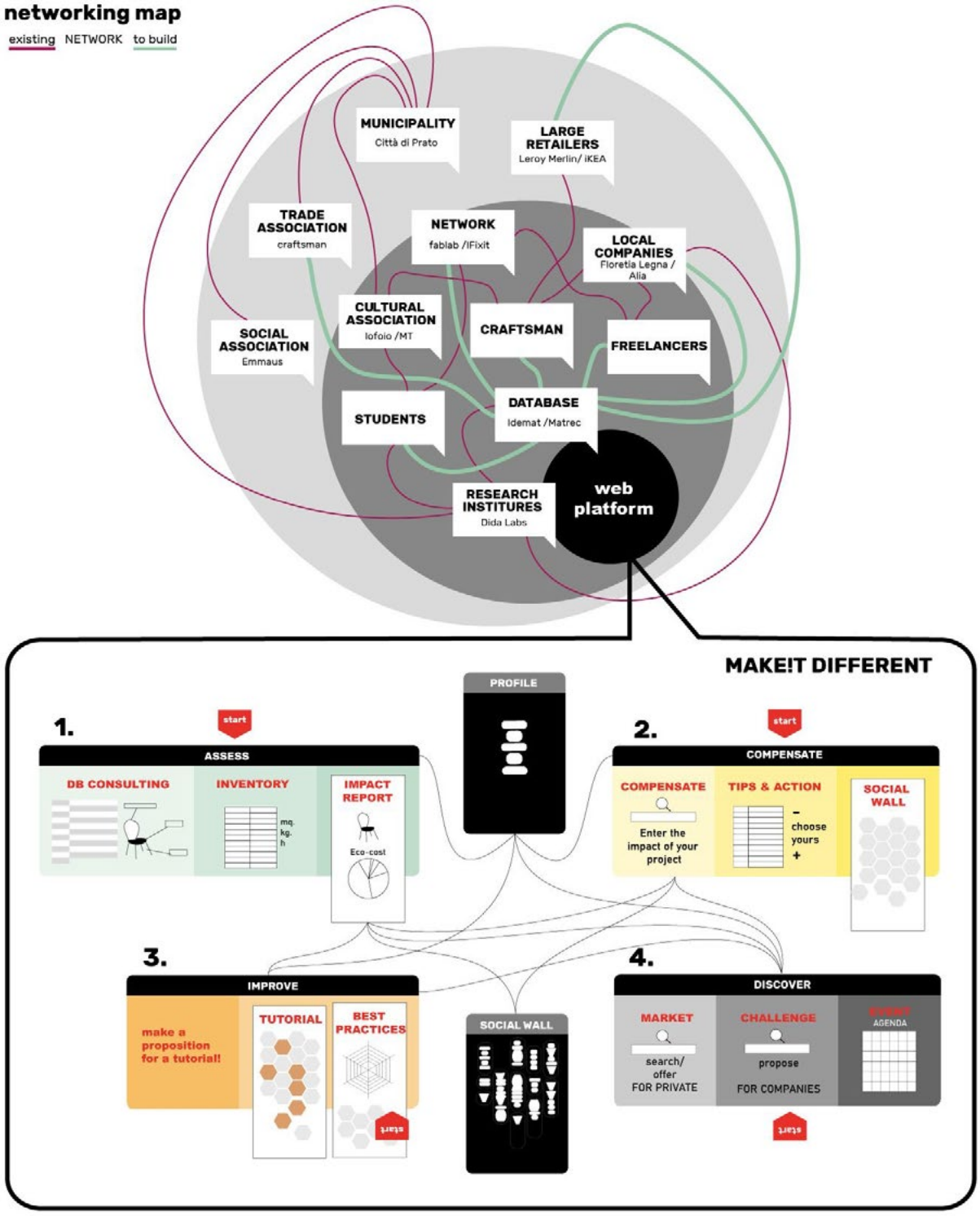

Fig 3. Networking Map and Platform Information Architecture of *Make!T Different Platform* (Dida team, 2022)

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Revived Vintage objects: Designing and Recycling as a bridge connecting Period Products to contemporary functions.

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Abstract

The combination of digital and vintage opens the possibility of giving life to a new concept of collecting, making it useful and contemporary, rich in functions that do not affect the form nor let story fade, by promoting the culture and give new life to the past, becoming interactive and usable, new and contemporary. After research on the technologies used in vintage electronic objects and settled how it can relate to current digital products, the research moved to a practical experimentation. The result is a reworked vintage object, keeping perfectly intact its aesthetics (still communicating its history) but providing a new and current function such as music diffusion, and compatibility with contemporary Bluetooth devices. Aiming to promote the good practice of recycling and reuse, as the transformation and updating of goods, to help the planet face the tough ecological challenges in a perspective of individual awareness.

Keywords

Re-use, Product Design, Vintage, Ecology, Consciousness.

1. Introduction

There are different ways and levels of remembering the past through objects, for those *unique and valuable* artifacts (the ancient ones), the cultural heritage is available through archives and museum. However, there is a large volume of artifacts that are less far from us in timeline and that also represent a period of history and can be enjoyed through collecting. Those products straddling the first industrial productions are available to free trade, this makes their preservation challenging since they are not owned by experts. Often bought for collecting or furnishing, many goods are readily available, particularly the production of electronic goods. Their value resides in a good preservation of the object, or more rarely, in the efficiency of operation over time. Often the condition of vintage objects makes them unusable, lowing their value and causing their deterioration or disposal by lack of interest. A striking example of this loss is provided by archaeology, where in less conscious times about 2 tons of animal and human mummies dating back to ancient Egypt were pulverized and used as fertilizer because considered irrelevant to archaeological purposes, as reported by Bettany Hughes in the documentary *"The Nile: Egypt's Great River with Bettany Hughes"* (Cherrington & Turroni, 2019). A perfect example highlighting the conservation of heritage is a result of the awareness of those owning it and weaving its destiny.

2. New consciousness in ecological practices and auto-production processes

According to the *Living, Planet report* our ecological footprint is currently 1.6 planets (2020), which means we would need another 60% of land to meet our current consumption needs. Although the ecological issue may seem far from our possibilities, it could also benefit the work of small businesses

or simply the good attitudes of individuals. Industrialization has accustomed us to fast rates of product replacement, particularly for appliances. Some of these goods can easily be self-produced or re-produced simply by reworking what's on our disposal or what's available in second-hand markets. This behaviour would manifest a renewed urban ecology that would benefit the planet. The clothing sector had a very strong value growth of the second-hand clothing sector from 2018. This growth started previous years found his boost during the pandemic, where the economic crisis and the population's desire to revert to more environmentally friendly practices led to a continued growth estimated to bring this market to a value of 80 billion by 2029 (Khusainova, 2021). In recent years, the expansion of e-commerce platforms for second-hand trade such as Vinted, Etsy, Vinikilo is evident. These platforms are mainly dedicated to second-hand clothing, anyway Etsy also offers handmade products typical of various cultures and Vinted also has a section for vintage objects, making these platforms interesting for the uniqueness of some products. Vinikilo, from Germany, had to adapt to this growth, moving from being a local reality to an e-commerce that currently fights in favour of ecology, against plastic and waste and organising initiatives such as "workshops to teach people how to repair clothes and extend their lifetime" (Khusainova, 2021). As described in *"Low-cost design"* book, industrialization, despite its benefit for the availability of assets, however, has distanced us from the awareness of production processes, in this perspective recycling becomes a re-appropriation of this awareness as well as an ecological attitude to be implemented whenever possible. This awareness promotes good practices and enhances the culture of the craftsmanship, auto-production, local goods and creativity. *"Fostering design by seeking to give objects a life after death - both physical, in the loss of function, and cultural, in loss of status"* (Perra, 2010, p.28).

3. A combination between vintage design product and new function

Looking for a meeting point between industrial production and awareness of production process has always been a main point in Design debates over time. Should Design deal only with a specific problem to be solved or should it also deal with expressive and aesthetic aspects? During the 20th century the trend of industrial design between essentiality and style was a consequence of social, economic, political and cultural conditions. There was a clear distinction between Styling and Design, the former responding to the demand for style and aesthetic and the latter responding to function. Depending on the economic situation, anti-rationalism became less evident in poorer periods and re-emerged in richer periods (Fiell & Fiell, 2016, p.7). Somewhat in contrast to the idea of Design complemented by Styling or anti-rationalism, the movement *Deutscher Werkbund* aimed to aware production *"of better Design in terms of both form and content"* and *"Without using ornaments an end in itself"* (Perra, 2010, p.28). During the paper we don't aim to decide regarding these two possibilities. But as demonstrated by the passion of collecting, where people often buy objects that are no longer functional, the value is intrinsic and derives from the form and meaning that the object acquires, both in antiques and in new productions. From a sentence by Castiglione, (1528, n.p.*), "Whatever you study, you will always discover that good and useful things are also beautiful and graceful"*. In the proposed experimentation the idea of cohesion between Design, necessity, style and ecology, finds a new dimension where preservation meets its hermetic collocation assuming contemporary functions and pleasing new needs.

4. Tv sets from 1960's: a very suitable good for practical research

As mentioned before, this paper began with a practical phase, subsequently highlighting all the ecological footprints. The object chosen for the practical experimentation is a television of the brand *Geloso* of Milan of the 60's. The television is part of a series of vintage objects whose original function is no longer guaranteed, even the very precarious aesthetic conditions have meant that the product has been used by the previous owner as a pedestal for other objects, passing the limit between an object to be preserved from a waste. This is a cathode ray tube television still containing all the original circuits unfortunately oxidized. The design and technology of these objects makes them particularly favourable for reuse and for updating their electronics. Due to the obsolete technology, the original components requiring a lot of space compared to contemporary ones, allowing to accommodate all necessary electronics for new functions.

5. Same components new combinations

Looking at the audio and hi-fi products currently available on market and comparing them to those under consideration, we can observe that technological development has led to a new generation of speakers not too far from those used in the 1960s. What has progressed most, however, is interface, and what allows be put them back into play is by working on the digital interaction with the user. Isolating the part strictly linked to sound diffusion, the gap for reusing the product is represented by the possibility of exploiting audio sources that are not, the TV set itself. What can bring the function of the object closer to today's usage is the possibility of use it as a speaker for different audio sources. This function is guaranteed by the great variety of Bluetooth amplifiers available on the market that act as a link between the audio source (computer, smartphone, tablet or any other device that has a Bluetooth transmitter) and the speakers of the TV.

After tackling the woodworm damage with specific products, the TV set has been completely disassembled to remove the accumulated dust and wood sawdust. The thermo-iodic valves and the electronic components including the cathode ray tube have been extracted and cleaned, the circuits have been desoldered to remove exhausted condensers and superfluous cables. The valves inside, while not performing their function, have been electrically reconfigured to turn on. Since those components emit light, those valves are characteristics of all products of that period and have been preserved. The cathode ray tube of the television has been opened to eliminate potentially harmful gas and phosphorus. The internal reflective coating of the cathode ray tube has been used to reflect the light of a lamp then put in communication with the sound emitted by the speakers. The connection between sound and light has been made through the recovery of a strobe unit dating back to the 90 '(one more recycled element). At the end of the transformation, the television is compatible with audio playback (excellent reproduction derived from the wooden sound box) through Bluetooth connection, is also able to propose lighting effects in combination with music. Also, the Tv still shows the original thermoidic valve circuit. All those new functions were obtained with the recycling of disused components and without affecting the aesthetics and history of the original device [fig. 1]. In addition to the reuse of vintage items, design is also part of the experiment when it comes to adapting new components to those retrieved. Over the years the size standards of the speakers have changed, the frequencies are now commonly divided between different speakers for quality reasons, the components (such as the amplifier and the E27 lamp) and the cables need new housings and safety systems (absent at the time of production of the tv set). Design with 3D modelling and drawing led to the making of 3D printed housings also for securing the cables and laser-cut discs for the correct housing of the speakers in accordance with the standard of the time. Laser cutting was also used to create housings for the tweeters, which are essential for good sound quality but were absent from the original product (the TV set).
A large group of those items available in Vintage market have similar internal parts whose recycle can be common. Based on the tv set the cathodic Ray tube is common to all tv sets from 1920 to 2000. So, the use of the internal reflective surface can be a tool for new function. Also, the restoration of the speakers and valves can be common to many electronic products of that period. An analogous example of recycling is that of the well-known brand *Bang and Olufsen*, which recently launched on the market a reboot of its *Beogram 4000c* turntable [fig. 2]. The turntable marketed in 1972 remains one of the brand's most iconic products, therefore in 2020 the brand repurposed it in an updated version. from the page dedicated to *Beogram, "Each unit has been restored and includes all the latest features while maintaining its timeless character."* (Bang-Olufsen, 2020).

Fig 1. Reworked Geloso Television (Credits Chiara Scarola, 2022)

Fig 2. Beogram 4000c (Credits Bang & Olufsen, 2020)

9. Conclusion

Once again, Design can play a fundamental role in establishing new connections between different disciplines such as Ecology and Technology, between past and present, in the possibility of recovering and enhancing. The communication between early industrial products and modern devices gives back new functions. This spark as well as those of similar projects, set in motion a process that can benefit environment and culture and that handed down to future generations will become an accessible practice for years to come. Design has the possibility to deal with reuse with a very wide range of possibilities and combinations, moreover reuse can bring Design to new and different viable directions. The aim is not to create a standard, but to show the possibilities and strengths of self-produced Design and its perfect fit with current ecological needs. However, despite that, experimentation has taken on a very specific character, and despite the aim is not to create a standard, it's glaring that many of these Vintage objects are made of similar components, so that the recovery techniques can themselves become similar and be spread through experimentation. The project, despite a reworked product obtained by recovering at least three disused objects, aims to serve as an example to raise people's awareness of how objects can be the perfect tools for recycled and self-produced Design in a strongly ecological practice.

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Nature-based design methods and practices for bathing activities sustainability

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Abstract

The contribution concerns intervention models and practices related to the design for the sustainability of the marine-coastal environment and the in-it hosted human activities. In particular, starting from the results of specific researches, the text presents experiences aimed at defining, around the "project for bathing", a new possible dialogue between habitats and cultural, economic and social needs. In this scenario, the culture of design can propose new goods and services which, acting on different scales, are capable of updating and integrating principles of coexistence and "sharing" between nature, territories, people and artefacts. The result is a design for the beach that interprets, in such a peculiar and problematic context, the theme of sustainability in a conscious and transdisciplinary way. It is introduced a "broad" and "plural" sustainability, capable of collaborating with nature respecting it, so rethinking new balances between ecological priorities and evolutions of behaviors and user needs.

Keywords

nature-based design, sustainable bathing, seaside design, eco-social design, design for territories

1. Introduction

The marine-coastal environments are contexts notoriously characterized by the combination of natural elements, artefacts and rituals and they are often in turn bound to the conditions imposed by landscape protection rules, in relation to the advantages of local communities, of the users and of all the economic chains operating in the tourism-seaside sector (Caruso, Cristallo, 2020). And it is in this delimitation that appear those "devices" characterized by principles of coexistence between the territory and people. These are solutions which balance the degree of anthropization of nature with a "bathing model" that has to be inclusive of new priorities and sensitivities. The field of investigation is therefore unique as a place with a strong relationship between nature and human activities and in which it is clear the evolution of social practices and, in relation to them, the environmental awareness of all users of the beach. It is introduced a "nature-centered" design is which, although admitting man as a main actor of the habitat, critically considers him part of it and, in this sense, responsible for the creation of a renewed role in the definition of new models of sustainability. This "eco-anthropological" condition is particularly useful in positioning the design problems relating to sustainable bathing and the related possible solutions not only on a technical-executive level, but on a much deeper examination that allows the environmental emergencies, the historical and urban planning analysis of the beach as an "inhabited place", the study of the evolution of local models, the relations with territories and communities, the observation over time of changes in needs, behaviors and different activities related to bathing and social rituals. The beach is also considered a "limit place" for the experimentation of typologies and technologies, of balances between the global and local dimensions, between public and private, of social inclusion practices and transdisciplinary planning. The research, therefore, alternating desk and field phases, proposes direct experiments, frames the experiences carried out in the international scientific debate and conducts a critical mapping of both historical and contemporary case studies. In this way the design-oriented innovation phenomena for seaside sustainability are circumscribed in a constant variation of the relationship between form-performance-users-environment.

Fig 1. The Elements, beach furnishings made in 3d robotic printing from marine plastic debrits. (Credits The New Raw, 2021)

Fig 2. Medonia, installation in Favignana island of the beach frame and dry Posidonia filled multifunctional sacks. (Credits Vincenzo Cristallo and Ivo Caruso, 2016)

Fig 3. Cane boat and shelter (Credits Antoine Boudin, 2014)

2. About design and beach sustainabilities

The research analyzes the historical-planning issues and the current problems relating to the sustainability of the so-called "anthropization of the beach". The context, which is made up of an articulated and multiscale system of furnishings, products and services, is still not sufficiently debated in a critical-design key and therefore it is considered important to reconstruct and describe its phenomenology. The bathing environment is examined in this essay on the basis of the results of four funded researches: "Medonia. The design for the safeguarding of Posidonia Oceanica in the Mediterranean beaches" (2016); "Spiaggiaverde. Design-oriented products, materials and actions for the development of the seaside environment" (2018), "Com.Beach. Development of infographic-based communication models for the seaside environment" (2020) and “Beach practices. Analysis of design driven models of bathing regeneration" (2021). These experiences, conducted both with desk and field actions, show, of the beach-sea context, its status of "inhabited and habitable nature" in which man over time has regularly brought together needs and interests and today, the foundations for a shared environmental progress. The complexity of contemporary living is fully reflected on it: from the evolution of habits to technological innovation; from economic to social changes; from ideological to cultural transitions.Therefore in these researches, the same scientific-disciplinary context was identified in a "territorialist" principle that overcomes a potential and limiting functional-environmental dichotomy for the territory, to give it back an essential overview to observe it as an organic and highly complex living system (Magnaghi, 2010) which manifests itself as a "choral subject" (Becattini, 2020) permeated by a value system identifiable in a multiform "territorial capital" (Zurlo, 2002).
In this direction, the "Spiaggiaverde" research represents a useful critical corollary of bottom-up actions that act in the long term and on potentially large impact scales. In this enlarged dimension, the design

project not only offers contingent solutions, but also conveys complex problems in order to propose solutions capable of generating common good, widespread impacts and therefore shared strategic practices in the inalienable synthesis between material and intangible needs, both local and global.
In this scenario, the actions that can be defined as “nature-centered” become first of all a tool for narrating the complexity of the events at stake and a critical guide to give life to examples of change that call into question the responsibilities of individuals and groups. Doing “things” according to these principles is equivalent to “questioning the cultural, social and ethical implications of emerging technologies […] and can help us define the most desirable futures and avoid the least desirable ones” (Dunne, Raby, 2013). In other respects, it corresponds to experiencing the public value of the project which manifests itself starting from “local” and “minimal” objectives, however capable of spreading adequate quantities of eco-social sensitivities (Manzini, 2015).
Downstream of these premises, some examples are reported below which represent some possible trajectories of innovation. These are design traces according to which we can organize, in support of the bathing supply chains, possible actions for nature and with nature.
As an emblematic example of an action to combat environmental emergencies caused by the presence of plastic debris, it is possible to mention the Sea Chair research project by Studio Swine and Kieren Jonesla. Born as an opportunity to report the gravity of the quantity of plastics present in the sea, the experiment suggests to fishing boats to operate as 'ecological vedettes' and to fishermen to work as creators of artefacts generated by the transformation of polluting debris. More recent is the Re-boe project by Flippo Zonno (2020), with which it is hypothesized, with the help of environmental volunteers, to recover plastic from the coasts and to reuse it for production, through a short-chain recycling process, of signaling buoys. Another emblematic experience is the one tested, starting from 2021, by the Vestre brand with the Coast project. The company, as part of the Ogoori environmental initiative, prototyped a bench made by reprocessing the polymeric waste collected from the beaches and waterways in Norway. With similar objectives, it is also possible to include the The Elements project (2021) by the Dutch studio The New Raw which defines beach furniture made in robotic 3D printing [fig. 1].
There is, then, an interesting category of practices that experiences the use of marine biomasses at the center of the design process. These special “natural debris”, even if they are an integral part of the ecosystemic cycles between sea and land, are elements that jeopardize the use of the beaches, thus limiting their economic potential in terms of tourist utilization. For example, in order to contribute to the management of the effects on bathing caused by the stranding of Posidonia Oceanica, the 2016 interdisciplinary research Medonia was born from the collaboration between the PDTA Department of the Sapienza University of Rome, the ENEA and the Protected Marina of the Egadi Islands. The aim was to collect the biomass and use it to fill soft sacks at the service of bathers near the rocks and as an integrated system with the so-called "bathing frames" [fig. 2], wooden structures with a shading function. At the end of the tourist season, Posidonia is returned to its habitat to help counteract coastal erosion and preserve the local marine biosystem. The virtuous relationship that can exist between biomass and the beach - which like Medonia is equivalent to converting a problem into a resource - is also at the origin of the surfboards, made since 2020 by Charlie Cadin upcycling beached sea lettuce, and of the work, conducted since 2011, by French designer Antoine Boudin who focuses on the use of reeds, agave and nets. In particular, the Provençal canes, which often invade the beaches following floods, are collected and, considering their mechanical characteristics, adopted to make beach furnishings, surfboards and small boats [fig. 3].

3. Objectives and Results

For all their purposes, these researches represent concrete evidence of the possible "pact" between design, territory and environmental heritage, in order to promote shared bathing models.
They are, therefore, practices that are experienced in the field of design "with" and "for" the territory connected to the milieu of the territory itself (Tamborrini, Stabellini, 2018). Not least, the intelligent use of endemic resources of all origins and species in the desirable framework of a real circular economy strengthens a cultural reform that naturally rises in the correction of consumption but above all in entrusting the project with a social role also considering political-strategic variables (Mortati et al., 2016).
These researches recognize the beaches as variable examples of ecological, spatial and social regeneration, within the disciplinary perimeter of "design for the territory". In general, they highlight the

relationship that insists between “territorial capital” (Thackara, 2008) and “seaside culture” (La Pietra, 2015). In other words, they indicate that any design action that takes place in the beach context is exercised in a "natural heritage" that requires types of regeneration that are the result not of opportunistic compromises but of intelligent practices in the inevitable mediation between nature and artifice. In this way, probably, sustainability, while assuming imperfect appearance, becomes the place of possible relationships between man and nature. It could be said that it is necessary to overcome an idea of "ecology as regret" (Maldonado, 1992) to join shared functional models, theoretical advances and effective wide impacts.

4. Conclusions and “open topics”

The context of the investigation highlights the contemporary need to rethink a complex form of sustainability whose equilibrium is achievable if the artifacts and practices will be able to balance the principles of naturalistic and landscape protection with the economic needs and expectations of the tourist-seaside sectors.
Given these premises and after of the field research actions we conducted, the contribution outlines a phenomena of international practices, their limits and, in general, the multipurpose and translated dimension that the culture of sustainability gives itself in setting up a debate that accompanies operational choices and a substantial change in social behavior towards the elements of these very special and fragile contexts. In this renewed perspective, nature, in addition to being an ecological priority, becomes a design and ideological guide in orienting choices and perspectives.
From the experiences we carried out, other scientific themes emerge with particular relevance. these are: the search for "models of convergence" between "social place" and "natural place"; the appropriate use of inaccessible areas or of "submerged beaches"; urban regeneration, the relationship of the bathing systems with territorial specificities, local communities and heritages; the increasing pervasiveness of digital technologies; the updating of social and wellbeing models; inclusiveness; interculturality.

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Design for social innovation: a proposal for an holistic design approach

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Abstract

Digital technologies have played an important role in redefining social relations; physical and virtual spaces, increasingly agglomerated, give rise to "hybrid communities of place", collaborative social networks that open new possibilities for sustainable design and rethinking the dynamics of design oriented towards social innovation. Transition Design proposes a method focused on the development of projects for desirable futures, related to the transition of the current socio-technical system starting from the activation of a movement of local innovation technological niches. The design approach is oriented towards a holistic view to restoring local autonomy and resilience; Transition Product design can have an impact on these kinds of transitions in the short term. The role of the designer is therefore to negotiate solutions that are inclusive and create community relationships that build the shared common good.

Keywords

New Relationships, Sustainable communities, Social innovation, Transition product design, Holistic approach

1. Introduction

When faced with new problems, humans tend to use their innate creativity and design skills to adapt and make something new: they innovate (Manzini, 2015). The exponential growth of digital technologies has had a strong impact on social dynamics: first of all, we see the emergence of new modes of social interaction, not always yet evident but with characters that are being defined and in line with the macro-evolutions of society. Two practices related to the new modes of interaction, which can take place in physical or virtual spaces, are "hybrid sociality" and "connected solitude" which in turn define new connections within social groups that Manzini (2020) calls "hybrid communities of place". Here, "community" refers to a network of people interacting collaboratively, "hybrid" emphasize the physical and virtual nature of interactions and "place" highlight an active and dynamic connection to the physical environment in which they are located. The ways of living and the ideas of well-being are radically redefined, opening up different possibilities for designing spaces and relationships linked to the new opportunities for sharing. The paper aims to investigate, in this context, what is the role of Design in meeting the needs of emerging communities in a perspective of social innovation, understood as the set of new ideas (products, services, models) that simultaneously meet new social needs and create new collaborations (Murray, 2010). Moreover, through the critical analysis of case studies - reported in the full paper - crossed with the research, future scenarios are proposed in which new practices and new models of operation will be tested. The thought of "hybrid communities of place" leads to a creative rethinking of existing assets (from social capital to historical heritage, from traditional craftsmanship to

accessible advanced technology), which aim to achieve socially recognized goals in a new way; what kind of spaces would society need if its main goals change from productivity and accelerated economic growth, to new forms of aggregation, sharing and employment? How would relationships in and between communities be nurtured? What is the role of design and how does design thinking change to activate local communities?

2. Article text drafting

The "smart city" is not enough to adequately withstand the changes that occur, its spaces are defined and the inability to imagine new ones, to meet new demands, makes it just an efficient echo version of existing urban models (Maak, 2019). In other words, this model limits the emergence of what Manzini calls "spontaneous infrastructure": communities, associations, and gathering places. In this sense, the countryside and rural villages seem to be able to represent a space of freedom, experimentation, and self-sufficiency, in which innovative technologies and connections to digital networks will allow the development of new services that recombine places, connections, and social co-presence (Thackara, 2019). A historical scenario that repeats itself: in the 18th century, the philosopher and political scientist Charles Fourier theorized the Falansterio, a self-sufficient housing structure in which the life of the members of a social unit took place within a building with dormitories, refectories, workshops, theater, library, etc.; that is, what was required by the needs of a large social aggregate. Everyone inside would share in the profits, being at the same time producers and consumers, in a perspective of design and holistic approach to life. Cosmopolitan Localism, proposed by W.Sachs (1999), can be considered the evolution of Fournier's thought. The theory of Cosmopolitan Localism concerns interregional and planetary networking practices among local communities that share knowledge, technologies, and resources. Cosmopolitanism refers to the awareness of our common humanity and co-habitation with the planet, while Localism is about satisfying as many needs as possible at the local level to optimize quality of life rather than maximize consumption. A theory at the basis of Cosmopolitan Localism is proposed by the theorist and economist M. Max-Neef of "Needs & Satisfiers" (1991), in which the ten Needs necessary for every human being are clustered. The ways of satisfying these are infinite and determine the daily lifestyles of a human being and the community in general. The modern economic model, aimed at the exasperated maximization of profit, offers centrally designed satisfiers that satisfy only one Need at a time in an efficient but generic way. Another aspect to consider is that the pursuit of consumption, rather than satisfaction, has led to extreme exploitation of available resources so that today we have reached the era in which our consumption has direct consequences on the livelihood of others. In this context, how can design generate a transition from an unsustainable lifestyle to a more sustainable one? The traditional design world being subjected to the dominant consumerist drive, the exclusion of complexity from design, the lack of value creation, and long-term solutions designed for society, are some of the issues that highlight the need for a redirection of design practices. In this sense, the design approach proposed by the discipline of Transition design provides a new methodology intending to influence new lifestyles in society based on the vision of Cosmopolitan Localism. Transition design turns its attention to two fundamental concepts: the idea that entire societies will face a transition to sustainable futures, and the realization that this will involve changes at a systemic level, triggered by understanding the dynamics of complexity (Irwin, 2019). Designing with complexity, i.e. "systemic" problems (climate change, biodiversity loss, etc.), requires a shift in approach that considers global issues and the impacts they have at regional and local levels. A significant change could occur thanks to solutions that come from below, which F. Geels (2006) defines as technological niches of innovation, capable of reacting in the short term to local problems derived from complex global issues. The temporal aspect of these interventions assumes significant importance: if on the one hand, it is necessary, in a Transition design process, to establish a medium-long term vision, on the other hand, it is necessary to understand how to act in the short term and begin to activate new technological niches for a sustainable

transition. According to Gaziously, new products are framed as potential enablers of transitions that lead to the development of additional products, which reflect the characteristics of the new or emerging socio-technical system (2019); from this perspective, we can speak of Transition Product design. Considering a local system from a holistic perspective, one can speak of a cluster in which materials and resources are managed by techniques and technologies and are relatable to the multidisciplinary knowledge of the community. A Transition Product designer works to create decentralized, distributed, and interconnected satisfiers to restore local autonomy; they design to facilitate system resilience by creating a temporal link between the project and the local community, with the view that the project will survive multiple generations of users. This approach parallels the theme of inclusivity and, in the design discipline, ties in with the principles of Universal Design, which advocates the importance of complexity and the need to give equal opportunity to the so-called "weaker component" of society. Design and its projects help to show how things could be different by suggesting new life goals and objectives; therefore, Universal Design presents itself as an approach that values and celebrates human diversity, where celebrating the individual does not preclude caring for the well-being of all (Szenasy, 2011). Underlying this inclusive approach is the thought that each individual has the capabilities, unique to each, to make an impact within their community. People decide to work together to achieve the results that have value for each and all; in this sense, Common Good is defined as belonging to a community where people can achieve well-being through relationships with others (Nicolas-Le Strat, 2016). Applying this thinking to design, the designer is at the service of the system, and the skills of design are used to negotiate new solutions, which can be sustainable for the community itself by setting as a goal the construction of shared common good; we can therefore speak of Design for the Common Good.

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Beyond the XX century's object: 12 keywords from the international design scenery

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Abstract

Design has proved to be a culture not only able to overcome the crisis of Modernity, but to emerge as a protagonist in the post-industrial age, through a reconfiguration of its thinking and practices. Designers explore new ways beyond a production homologated in its aesthetic and symbolic values, in favour of new pluralistic visions, the recovery of the affective relation with objects, a freer and more imaginative use of technologies.

The digital and telematics technologies revolution, the ecological matter and a new scientific imaginary contribute towards the modification of the traditional vision of the objects, and influence propensity of design for interdisciplinary collaboration. Through an in-depth overview of recent international production in the field of product design, the research has identified a variety of emerging phenomena: condensed into 12 keywords, each representing the overcoming of a limit of the Modernity, but above all an opening to the near future.

Keywords

Sustainability, *post-industrial age, design trends, product design, aesthetic paradigms.*

1. On the wings of technical innovation

With the advent of the post-industrial age, the most rigid principles of international functionalism found a theoretical and concrete reaction from design culture. The object of design re-emerges from the crisis of rationalism with new traits, new energy and a more fluid nature. In avant-garde attempts, in visions of art, in utopian aspirations or in practical experiments of designers, a tension is constantly present in the 1900s, towards an object that is no longer inert, but rather inspired to biological systems, evolutionary and sensible; during the second half of this century, specifically, the evolution of the design object is influenced by three main concepts: *sustainability*, i*nnovation* and *dematerialisation*. *Innovation* is understood primarily in the sense of scientific and technological achievements; but with an important clarification: *on the wings* of technical innovation, comes back in through the window that science itself had theatrically thrown out through the door: this "something" is the profoundly anthropological value of man's relationship with objects (La Rocca, 2017).

The research aimed to identify influential phenomena that characterise design in the post-industrial age; each of them is useful for interpreting the contemporary project as *elastic deviation* from its modern matrix. It is indeed crucial to remember that Modernism has always been characterised, as many critics have pointed out, by a *profound ambiguity* with regard to its monological version; so, the emergence of its unresolved units of thought represents a high potential energy, which still has to develop new directions of expression in the future.

Fig 1. a) *The living.* Algaerium Bioprinter Marin Sawa, 2013 b) *The enigmatic*. Ying Gao, Film noir, 2021. d) *The thinkered*: Kyouei design, Pendulum sound machine, 2011. *d) The formless.* Detail of the Nacho Carbonell exhibition at Carpenters Workshop gallery, 2018.

2. Giving the floor to objects

The research started in 2014 and has continued uninterruptedly, also updating the projects over time. The survey involved direct contacts with more than 100 emerging designers and design studios, through which the investigation was linked to particularly innovative exhibitions and events. Special attention was given to contests aimed at young designers. The specific analysis of the international product design scene, developed in collaboration with Chiara Scarpitti, was based on 12 main *keywords*. In the economy of the present article, each keyword can be emblematically represented by a single project image [Fig. 1-3]. *The living*. It is an object going beyond the idea of mechanical and inert, not evolutionary. In recent years, design research is moving along the increasingly flexible boundary between the object and the living system. The attraction for the biological, from utopian aspiration of the avant-garde of the 20th century, increasingly fits with new acquisitions of scientific research and biotechnologies. New figures of designers with specific skills and interdisciplinary teams conjugate in new forms project with chemical research and bioengineering, creating interesting short-circuits between science, technology and art (Myers, 2012).

The enigmatic. Absence of ambiguity and mystery, these are the characters of the rationalist project that design today wants to overcome. Many protagonists of today's creative scene are dealing with an aesthetics of the indefinite, the ambiguous, the blurred, also approaching other cultural vision of the universe of objects, in particular oriental philosophy. The dematerialisation of the technologies, the miniaturisation of electronics, in some cases contribute to a product difficult to understand in its traditional form/function relations.

Fig 2. a) *The connected.* Katia Prins, Shifting perspectives, Wall objects1 (detail), 2016. b) *Bare nature*. Michal Fargo Cutting tool, 2015. c) *Neo-material*. Kyouei design, Form of light force transmission, 2013. d) *Mini-ego*. Giulio Iacchetti e Matteo Ragni, Tombini, 2012.

The thinkered. Beyond the myth of the new, this word blends "thinking" and "tinkering": re-use, as an opening to consider what pre-exists and is available to reworking, is a key theme of sustainable design, against a project method starting out from an ideal tabula rasa. Design also appears able to produce innovation starting from disorderly, random pieces of what exists, be it nature or history, imagining them in an all-new scheme. To reconstruct a relationship between thought and concrete doing: the re-assessment of the tactile, relational and incomplete is today one of the turning points in imagining a new creative approach. (Sennet, 2008).

The formless. Designers refuse the dogma of an idealised form, rigid geometries, aseptic beauty. "Could we not say that every form invented is seen as a fold - until crumpling, until becoming formless and tearing – of a previous form?" (Didi-Huberman, 2006). The idea of the formless has been taken – in the wake of the famous definition by Georges Bataille – as an interpretative instrument for contemporary art, against the modernist conception of the form (Krauss & Bois, 2003). The deliberate alteration of a form or type; crushing and falling of materials; deconstruction of the scene or liquefaction of the object. When questioned by Le Corbusier as to the future of architecture, Salvador Dalì answered provocatively: "it will be flaccid and hairy".

The connected. Contradicting the concept of the thing as an isolated entity, many contemporary artefacts only gain a sense insofar as they are connected, nodes of a network and of a wider system of communication (Scarpitti, 2020). Systems that interact not only with us, but now even amongst themselves: in the era of the *internet of things*, they interfere with the collective knowledge. Design is deeply involved in the development of devices whose essence lies in their role as exchangers: discreet presences of the everyday, they are a resource in fostering creative collaboration, the sense of a social and sustainable environment.

Bare nature. Design goes beyond a deterministic vision of the nature aesthetic, as sort of side effect of

Fig 3. a) *The sensory.* Lesley-Ann Daly, Commodification of metamorphosis, 2017. b) *The fetish*. Shamanism. Exhibition "Fetishism in Fashion &Design", 2015-2016. c) *The absent*. Ying Gao, Indice de l'indifférence, 2006. d) *The dramatic.* Exhibition "Independent Design Secession" 2011: Giulio Iacchetti*, Untitled 2010; Andrea Branzi, Grandi Legni GL19,* 2010.

form-function compliance. "The artist-alchemist organises living and plant things into magical facts, working to discover the real heart of things, to find them and exalt them" (Celant, 1969). These words about the movement of Arte Povera, in the late 1960s, adapt well to the defining, many years later, new critical visions of nature in design. Designers today show a great interest for the natural element as a fragment that can be drawn from without mediation; varied interpretations of a relationship with nature, packed with symbolisms, made up references to the mystery that is intrinsic to it.

Mini-ego object. No longer a producer of status symbols to be flaunted, design establishes itself as microsociology of the everyday life; in this sense it is a powerful instrument to express, with analytical precision, only apparently minor values. "My only intention is to take things from everyday life and use them scientifically", Sigmund Freud wrote. A new generation of designers make their small gestures and discrete intervention into a form of poetry and aesthetics (Finessi, 2005). Bruno Latour identifies an escape route from a *muscular artificiality* in the care and attention to detail, for a world of objects that instead contemplates material, morality and sustainability (Latour, 2008).

The neo material. Designer want to overcome the scission of thought, machine and hand. The tendency to become once again producers in the first person, the possibilities offered by numerical control machines to be personalised, the contact with materials – with a search for the rare and unexpected – stimulate designers to a new laboratory dimension. Neo-craft design scene is at the opposite end of a model in which industry is delivered the project as an established matrix, to be executed and automatically replicated. In the staff laboratory, in the individual process something always happens: as Le Corbusier wrote, "passion makes inert stones a drama".

The sensory. Against the devaluation of the empirical knowledge and the exclusion of the sensory range we have new generation of products. “Les sens ne trompent pas. Le palais d’un fin goûteur juge plus precisement que mille machines (…)” (Serres, 1985). A *sensory revolution*, as Branzi has defined it, has found fertile ground in recent years (Branzi, 1992). Chromatic values, environmental music, microclimate, olfactive experience, haptic perception of materials: all aspects neglected by rationalism, which see the body immersed in a global experience, become today material for the project.

The fetish. As a reaction to the exclusion of the symbolic, the anthropomorphic and the zoomorphic, the fetish refuses the closure of the product in the mere function. Fetishism is not a fogging of the “wild thought”, but rather it condenses an excess of meaning. (Lévi-Strauss, 2010). Beyond the “soul-less” object of rationalism, Designers of the nowadays scene charge their product with new symbolic energies, exploring fetishism in its different declinations (Edelkoort & Fimmano, 2013); occasionally, in the fusion with advanced technologies, the sense of the archaic blends with concrete animated devices.

The dramatic. Not only in the field of art, recently also the design project show interest to go beyond the censure of the real, the exclusion of existential themes and the dimension of the sacred (Branzi, 2008); above all because this removal is perceived as the result of a world flattened out for industrial and marketing needs. In the exhibition *Independent Design* edited by Branzi e De Lucchi in 2011, emerges an original vision of design as a culture that can face up to the matters of religion, history, irrational and tragedy.

The absent. Sustainable design refuse the uncontrolled multiplication of objects and the *hard and soft contamination* of the consumerist society (Serres, 2009). The matter is double: the *hard* contamination by products, but also the *soft* contamination by information: a space crowded with messages and intangible connections. So, a poetry of absence is today interpreted in many ways by design. That “life without objects”, provocatively considered in the early 1970s Radical Avant-Gard, corresponds to a challenge in the current condition (Sottsass, 1978). Fig 3.

3. A vision and a movement

Taken together the keywords, reflect a *vision* and a *movement:* on the one hand, the point of view of critical thinking that tries to untangle technical, aesthetic and ecological aspects in the object; on the other hand, the vital movement that design shows in a nomadic, unconventional and fertile collaboration with the most disparate disciplines of science and art.

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Design for and with visual impairments through 3D printing: a case study from the covid-19 pandemic

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Abstract

This work aims to investigate the contribution of the design practice and 3D printing to improve the learning experience of visually impaired students through a collaborative design case study. The collaborative development of "IO", a multifunctional tool for visually impaired students in distance learning contexts, is presented in this work together with the results from the user tests of the experimentation. Thanks to the open design principles and the flexibility of 3D printing, these assistive tools can improve the learning experience during the whole school career regardless of disruptive events i.e., the Covid-19 pandemic.

Keywords

Open design, Covid-19, Additive manufacturing, Collaborative design, Inclusive design.

1. Introduction

The covid-19 pandemic has been affecting several aspects of human life since its outbreak in late December 2019. This event led to a global crisis that changed the daily habits of millions of people. Different countries have been imposing lockdown to tackle the pandemic situation and to reduce the virus spread ratio, generating new socio-economic problems (Nicola et al., 2020). The global medical community experienced a severe resource shortage due to the overloads caused by SARS-CoV-2. Digital technologies and additive manufacturing played a crucial role at the beginning of this pandemic thanks to their flexibility compared to the traditional processes (Irfan Ul Haq et al., 2020; Oladapo et al., 2021). The local and global actions of citizens and fab labs mitigated this supply chain crisis thanks to distributed manufacturing strategies (Kieslinger et al., 2021; Longhitano et al., 2021; Pearce, 2020).

Several people had to quickly adapt their lifestyles in response to this disruptive event. The activities of people with physical impairments have been strongly affected by the lockdown restrictions (Lebrasseur et al., 2021; Senjam, 2021; World Health Organization, 2020). For instance, the closures of the education institutions forced students to online classrooms, adding further barriers for those living with visual disabilities (Balkist & Agustiani, 2020; Battistin et al., 2021). Recently, some projects have been developing new tools for the learning experience of visually impaired students. However, these solutions are still focused on in-presence activities or offer limited haptic feedback to the users (Castilho et al., 2020; Ciano et al., 2021; Krahe, 2020; Samonte et al., 2019; Somma et al., 2021).

How can design practice and 3D printing processes contribute to improving the learning experience of students with visual impairments in distance learning contexts (Buehler et al., 2015; D'Olivo et al., 2020; Romani & Levi, 2020)? How can their contribution be actual even beyond a disruptive event for the daily habits of visually impaired students?

This work investigates the potential contribution of open design and 3D printing to improve the learning experience of visually impaired students. This paper presents the collaborative development of *"IO"*, a tangible assistive technology tool for visually impaired students in distance learning contexts (Mattiuzzo,

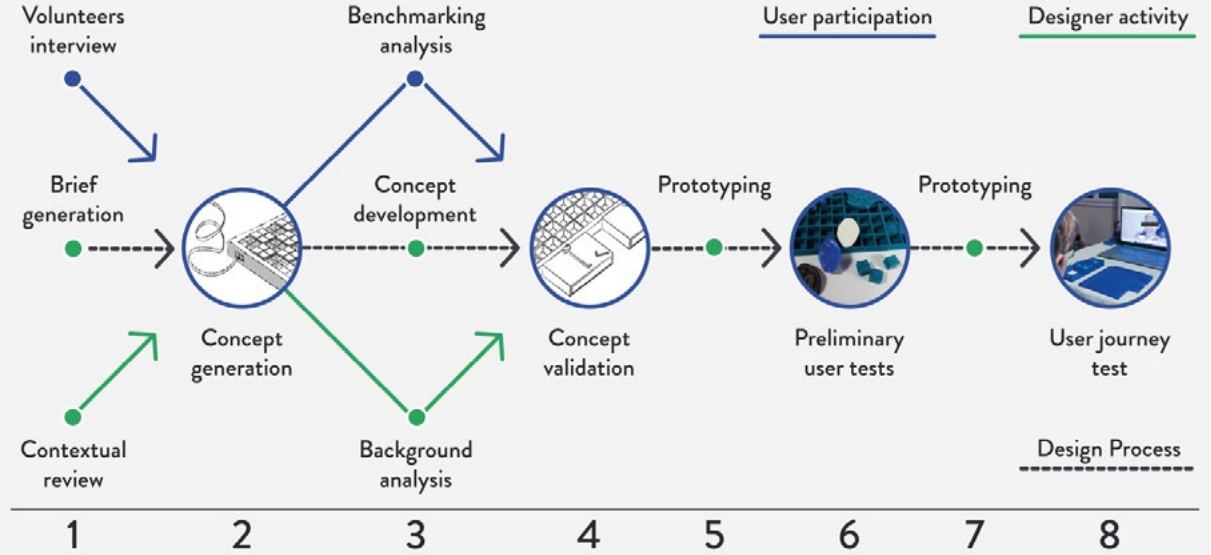

Fig 1. Steps of the research: 1. Preliminary phase with the generation of the brief, the contextual research, and the interviews. 2. Main ideas/concepts generation. 3. Project research to develop the concept. 4. Selection and validation of the concept. 5. Development and prototyping of the mock-ups. 6. User tests with the mock-ups. 7. Definition and prototyping of the final proposal. 8. User journey test with the final prototype.

2020). After the explanation of the research workflow, the tool is briefly described together with its use, potential distribution, and customization. Although further work should be done, these kinds of assistive tools may significantly improve the quality of life of the users during their daily habits, regardless of disruptive events such as the Covid-19 pandemic.

2. Methodology

This work shows collaborative experimentation based on a Research through Design approach (Buur & Matthews, 2008; Friedman, 2008) carried out with two Italian associations of visually-impaired people (Unione Italiana dei Ciechi e degli Ipovedenti ONLUS, Fondazione Istituto dei Ciechi di Milano Onlus). Fig. 1 resumes the general development workflow of *"IO"*. The activities were organized as it follows:
1. Brief proposals from the contextual research and the interviews with the associations' volunteers.
2. Generation and selection of the ideas/concepts according to the previous interviews.
3. Project research through a benchmarking and context analysis of the existing learning tools for visually impaired students starting from the volunteers' experience.
4. Validation of the most promising concept thanks to the feedback of the volunteers.
5. Product development phase and prototyping of the first mock-ups for the user tests.
6. Preliminary user tests on the haptic perception of the 3D printed parts with the volunteers.
7. Product definition thanks to the previous step and prototyping of the final proposal.
8. User journey test in a simulated distance learning context with a blindfolded student (primary school).
Two lockdowns were imposed in Italy during the experimentation of this work (2020). A preliminary interview was carried out with five volunteers to understand the daily habits of a person with visual impairments during the Covid-19. 3D printed mock-ups were used as the main communication tool and facilitated the collection of feedback on users' experience and haptic perception (Hartcher-O'Brien et al., 2019; Karlsson & Velasco, 2007; Metatla et al., 2015; Sanders & Stappers, 2008). The prototypes were made with a desktop-size 3D printer and commercial PLA and PETG filaments.
A user journey test was carried out with a blindfolded student at the primary school in a simulated distance learning context (late Fall 2020). The simulation focused on the use of *"IO"* before, after, and during the learning activity. The tests were done with a videoconferencing app. One author acted as the educator, while the other researchers and the child's parents gathered information, pictures, and videos.

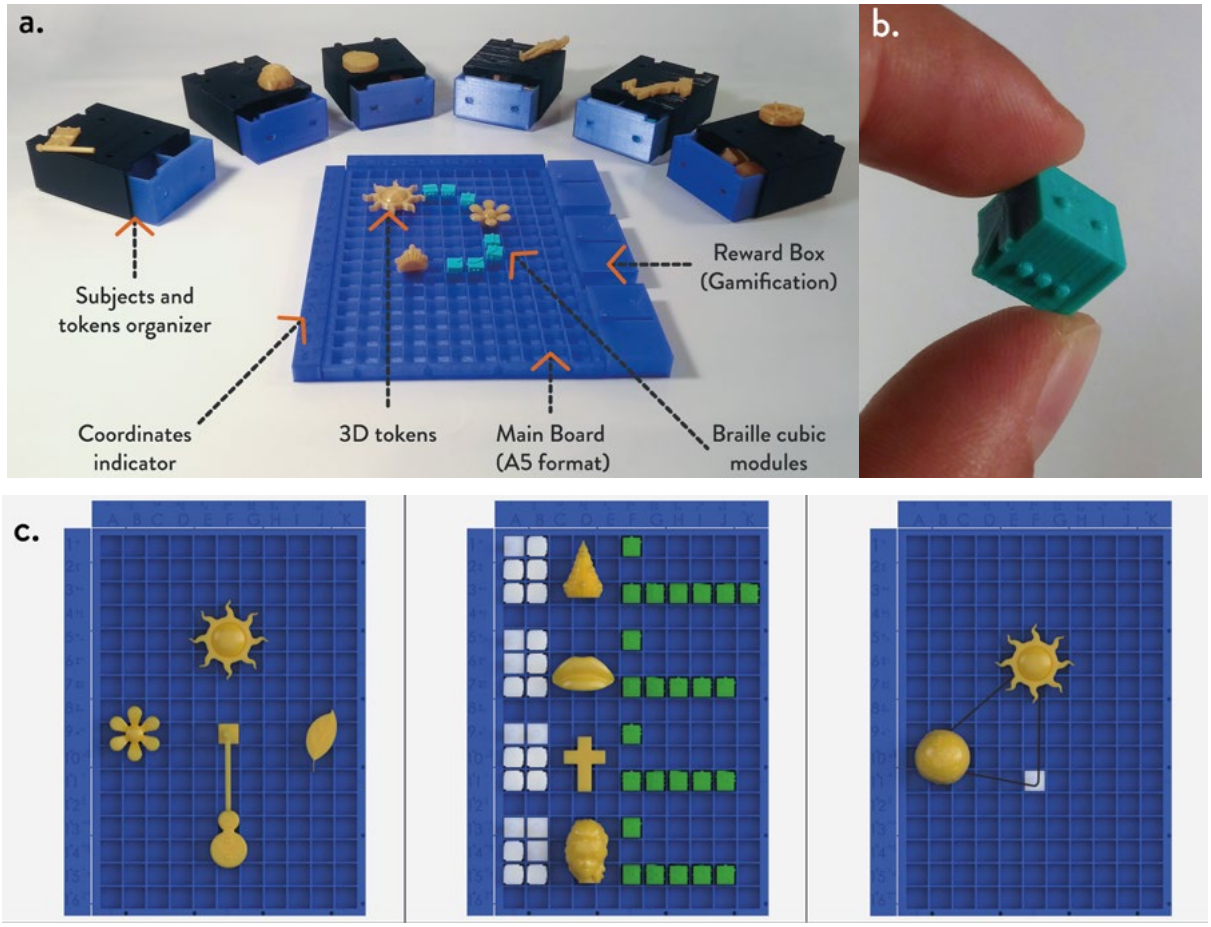

Fig 2. "*IO*" Multifunctional tool: (a) main components; (b) a braille cubic module; (c) three use configurations (from left to right: primary school activity on the four seasons, primary school braille and alphabet activity, and high school activity on the orbital rotation).

3. Results and discussion

"IO" aims to translate, through haptic feedback, specific learning concepts that are difficult to explain without visive support. It can be used autonomously in distance learning contexts through the coordinate system and the storytelling of the educator. This tool can be customized according to the user's needs, i.e., different school subjects, new learning modules, or leisure activities. The educators, caregivers, other classmates, and friends can interact with *"IO"* as secondary users. Moreover, *"IO"* can engage the students through gamification strategies, i.e., game rewards for primary school activities.
Fig. 3a shows the main components of *"IO"*. In detail:
- The main board is used to place the braille modules and 3D tokens. It corresponds to the A5 standard and can be combined with other boards to enlarge the user space, i.e., A4 format.
- The two coordinates' indicators (one sequence of letters and one sequence of numbers) help the users to place and read the braille modules and 3D tokens.
- The organizers collect the different braille modules and divide the different subject school 3D tokens.
- The braille cubic modules are the basic alphabet of *"IO"*. Each module has four faces with braille letters and tactile graphic signs for graphs and schemes [fig. 3b].
- The 3D tokens represent specific signs and can have different meanings according to the activity, i.e., "sun" as summer or as solar system star.
- The reward boxes can be used for the gamification of the learning activities by inserting a reward.
Some school activities were designed to validate the overall idea [fig. 3c]. Other modules can be added

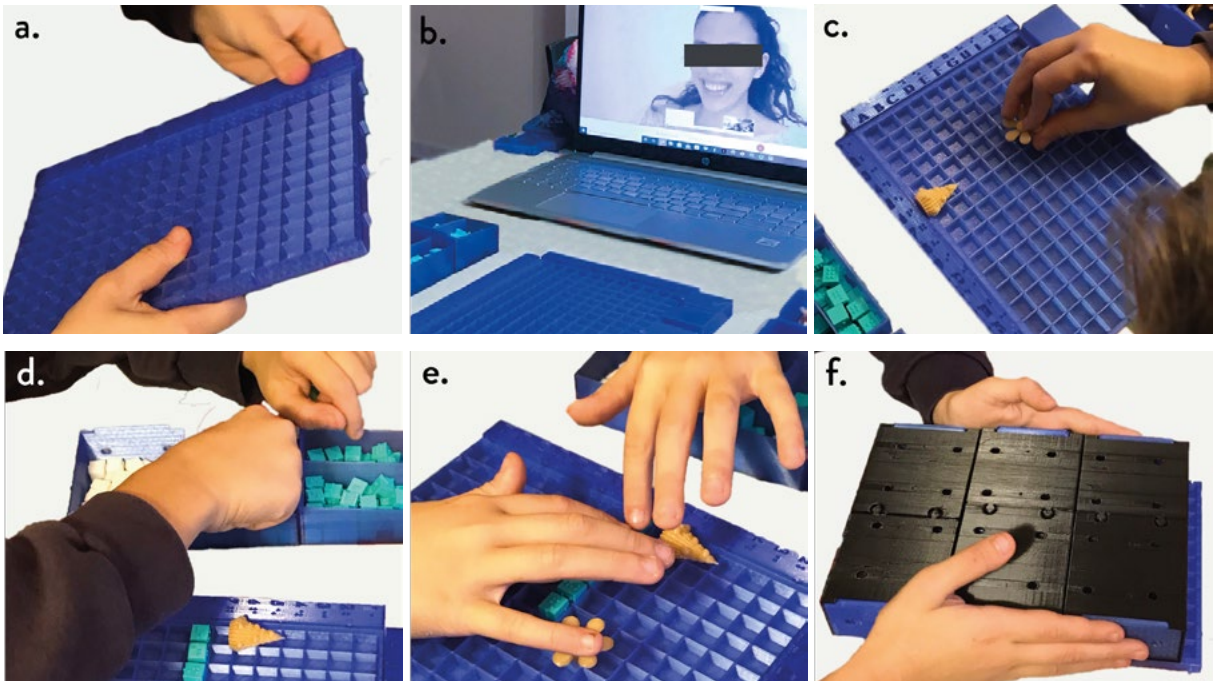

Fig 3. Use of *"IO"* in distance learning contexts: (a) spatial organization of the components by the student; (b) explanation of the learning activity; (c) positioning of the 3D tokens and braille modules guided by the educator; (d) identification of the braille letters for the correct selection; (e) reading of the resulting spatial order and explanation from the educator; (f) removal of the pieces and reorder of the components.

or customized with low-cost desktop 3D printers, i.e., new 3D tokens.

The user journey test simulated an online activity of primary school students with visual impairments during a lockdown, helping in defining the use of *"IO"*. Before the class activity, the student can organize the components of *"IO"* on the table, i.e., connecting the coordinate system to the mainboard. The class activity begins with the educator's explanation of the learning activity. The student detects and places the 3D tokens and/or braille modules thanks to the educator's guide and the coordinate system. The student can then read the braille modules and understand the 3D tokens by touching the components. Finally, the student can reorder the components of *"IO"*.

"IO" can be also used in conventional school environments, i.e., in-presence classrooms. The primary and secondary users can interact and design new activities to improve the learning experience and create more inclusive class environments. Hence, these assistive technology tools allow users to actively customize their products. Users can become "prosumers" by prototyping and modifying *"IO"* according to their needs. This specific practice falls under the umbrella of the open design concept, i.e., Do-it-yourself, and encourages sharing new designs, promoting their use, and collaborating for their implementation (Boisseau et al., 2018). Different levels of customization may be achieved depending on the specific users, the specific environment, the different activities, and the age of the student. This freedom should encourage the real use of *"IO"* by focusing on the long-term learning experience regardless of a specific disruptive event, i.e., the Covid-19 pandemic.

3D printing represents a way to make a specific tool accessible to a wider audience. *"IO"* and similar tools can be distributed with Open-Source licenses through online repositories (Thingiverse, Github, Zenodo) encouraging distributed collaborative networks of individuals (Buehler et al., 2015; Rayna & Striukova, 2021). Hence, users can purchase *"IO"* in different ways, i.e., at home with a personal 3D printer, in a fab lab, in a physical 3D printing shop, or from an online 3D printing service.

4. Conclusions

This work investigated the contribution of collaborative open design and 3D printing to improve the learning experience of students with visual impairments in distance learning contexts. The results provided an overview of how *"IO"* can be used in online classrooms and other scenarios regardless of specific disruptive events, i.e., the Covid-19 pandemic. This tool grows together with the student according to their specific needs, encouraging collaborative work for its customization. Design practice and 3D printing can contribute to the distribution and customization of *"IO"* and similar tools thanks to the collaborative approach fostered by open design and the Open-Source distribution.
Further efforts should be done to deepen this study. Due to lockdown restrictions, user interviews and tests were limited to a little group of volunteers, and user journey tests were carried out with a single user. Additional tests should be done with different users and in other contexts. Furthermore, this promising collaborative approach may be extended to different assistive tools and users' needs.

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Design and craftsmanship for urban regeneration

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Abstract

The world of design and especially the one of product design, while starting from democratic intentions, over time, it has been relegated to an elitist setting without being able to really make its own the themes of recycling and the relationship with the craft that are the real challenges of the future.
The theme is not so much to answer through an ancient optic aimed at returning to the querelle craft versus industry as, rather, try to superimpose the two realities to arrive at a more agile approach and a strategy that allows with small interventions to trigger virtuous mechanisms, both from the point of view of sustainability and from that of superimposing and distilling the ways of the different approaches making them really collaborating.
In this sense, so that the themes of craftsmanship can really connect to those of industrialization, We could start by using small opportunities to trigger positive mechanisms with added social value and marked by a widespread beauty where technology does not dominate relationships but is at its service.
In this direction it is right to think of a concept of urban regeneration that starts from design using a specific point of view with, however, a more general look: design, architecture, technology, urbanism and all disciplines aimed at improving the human being on earth.

Keywords

urban design, site specific, modularity, flexibility, dehor

1. Misunderstandings about the idea of design

For a very long time we have witnessed a specialization of industrial design that has constantly moved towards the production and imagination of a beauty too sophisticated, partial and within reach of a few. The design of the product, despite the fact that for some time it has preached an adherence to the issues of recyclability, ecology, inclusion has not been able to become a light and democratic tool that would allow a participatory relationship, easy and economical between ideas and production if not remaining attached to the concept of a widespread industrial product.
We are faced with a series of questions that are not rhetorical but necessary. Vanni Pasca, in an article published in Op.cit. questions what design is today and what thematic dimensions it has reached, if it is not now a somewhat generic notion of design.
Defining design today is difficult. His practice has extended to previously distant areas.
The subject I am interested in addressing today is not a nostalgic return to the past but the rethinking of a discipline that has amply demonstrated its value.
I therefore believe that, building on the experiences accumulated, the new way of looking at the world of production and the urgencies of the new millennium, a step backwards today can be a significant leap forward.
In particular, I think about the design of the product and the opportunity to bring it closer to other disciplines, crossing the knowledge, optimizing the results, putting into practice a joint action that can respond to current needs and be at the same time generator of virtuous modes and approaches. Since the ancient polemics between craft and industry, this dichotomy has been posed in peremptorily antithetical terms.

What has happened in recent years, however, has convinced European and international culture that the conflict between craftsmanship and industry is a false problem.
In fact, production, ideation and realization are not the only elements of a process that today can be much more extensive and flexible.

2. The site specific and variations on the theme

The unique piece, the site specific, the variations on the theme, reuse, attention to individuality can be significant opportunities to redefine in personal and collective terms a new concept of design that in fact constitutes the recovery of past values and modes reinterpreted in a contemporary key.
The challenge today is to work on all those actions that starting from modifications, alterations, reuses, stimulate a new aesthetic dominated by imperfection and the trace of Hand-made as a quality imprint.
We must imagine, starting from the features of the places, a non-serial aesthetic, a revision of production strategies, a new relationship between technological sophistication and avant-garde aesthetics.
We must learn to put into play what exists, reduce waste, raise the threshold of obsolete matter, so as to inhabit a planet that is not only made of architecture or revision in natural and environmentally friendly terms of the architecture itself, but also and above all, of something lighter, easier, modifiable that helps to build environments, interior and exterior spaces that extend and enrich the concept of living in both private and public spaces.
The dehors theme of the post-pandemic cities could be an exercise of great interest where the principles of urban design and habitat on a human scale and environmentally friendly can be used and made immediately applicable.
It would be like carrying on and pushing contemporary themes and principles contained in the famous exhibition Italy. The New Domestic Landscape, reinterpreting and making the most of the enormous legacy left to the international culture of the project.
In fact, precisely in relation to these themes that boast a genealogy of more than revolutionary authorial responses, especially in an anticipative threshold of attention to the issues outlined so far, today, more than ever, it seems appropriate to work by valuing all that the avant-garde put at the center of their research and experimentation.
In this direction, what in the sixties seemed a distant utopia, today could be concretely transformed into an inexhaustible creative and realization resource.
It would be desirable to think of a chain marked by the idea of an infinite project, that is, by an action that does not stop at the prefiguration of a new always necessary, but that goes back and forth in time until you configure mobile scenarios that are changing and at the same time solidly useful in their metamorphic attitude.
In this sense, recalling what Emanuele Coccia wrote in his latest book on the concept of metamorphosis, we are finally called to be part of a single and immense physical body.
A mental and scientific entity that the recent pandemic has highlighted making absolutely equivalent the principles of mutation present in the different species of races of living beings and especially in their extension in the objects.
Therefore, we were finally aware of how many interactions exist between people, things and thoughts and how these interactions allow us to look at the practice of the project with more empathy and more attention to the deeper substance of things.
In this sense, think of cockpits for open spaces, transformable according to the needs and seasons, energetically autonomous but also productive, beautiful, modular and made of parts reusable and reassembled in different conformations, could be a very interesting road to follow.The Edoardo Chiossone Museum of Oriental Art (Mario Labò. Genoa, Italy, 1948-1971) fits into the urban park of Villa Di Negro and houses an important collection of Japanese art (Failla, 1996). The interest to this project is also determined by its relevance in the historical context of Italian museum architecture, being the first museum built from scratch after the Second World War (Lanteri Minet, 2021).
The building is small in size and has the most interesting place in the exhibition hall; the latter is composed of cantilevered floors that develop along the major sides leaving a central void at full height [Fig. 1]. The apparent formal simplicity of this space hides the complexity of the path: in fact, the connecting stairs between the floors draw a path of ascent and descent that do not coincide, in an arrangement that is difficult to understand from the ground floor and which reveals itself only during the

exploration. These compositional aspects, together with the multisensory components present, are particularly suitable for illustrating the objective of this contribution.

3. More lives over time

This model, codified in its general principles, could then be exported and applied to other areas. More and more often, in fact, public places become the scene of events that involve the inhabitants and attract visitors.
Use these opportunities to experiment and put into practice innovative urban installations that can fulfill the required uses and at the same time add value in terms of beauty, security, functionality and even more popular possibilities of a lifestyle that is already in place but still does not have a formal statute. In fact it grows more and more and spreads a new concept of urbanity that develops through "nodes" where cultural exchanges take place and which use new communication technologies to activate new forms of sociality in support of the development and promotion of cultural resources.
Design, more than architecture and urban planning, can answer this question by proposing smart solutions that also take into account digital innovation.
I am referring to the possibility of building parts that can compose and set up temporary and transformable spaces, energetically autonomous, and give shape to the demands of citizens, but also of the numerous associations that deal with the use of public spaces as opportunities for social development through the creative use of the city.
In the near future, which has already begun, it must be a life that has in its genome also the opportunity to change over time through visible additions, subtraction, reversible elements that replace the only architectural concept based on heavy and decisive actions.
Ultimately, our research must focus precisely on the flexibility that the advantage of differences makes use of, overcoming the monotonous and ancient concept of series.
The aim, however, is not the narcissistic representation of the individual but the construction of a space and an environment for those groups of people who recognize themselves in the same values.
It may seem too ambitious a design, but in reality it would be much easier to put it into practice than just stating it.
Such an action could concretely regenerate a circular, local and sustainable economy. A strategy that starts from the places to draw on a global dimension and not vice versa and that moves through the selection of some examples or ways of doing that are in line with the new needs that the contemporaneity requires us to respect in order to achieve a a truly conscious attitude to the project.

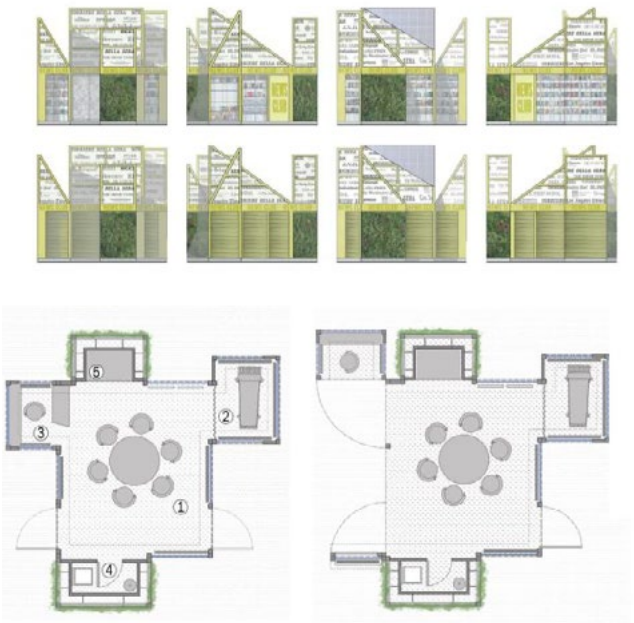

Fig 1. Technical drawings (Gambardellarchitetti, 2020)

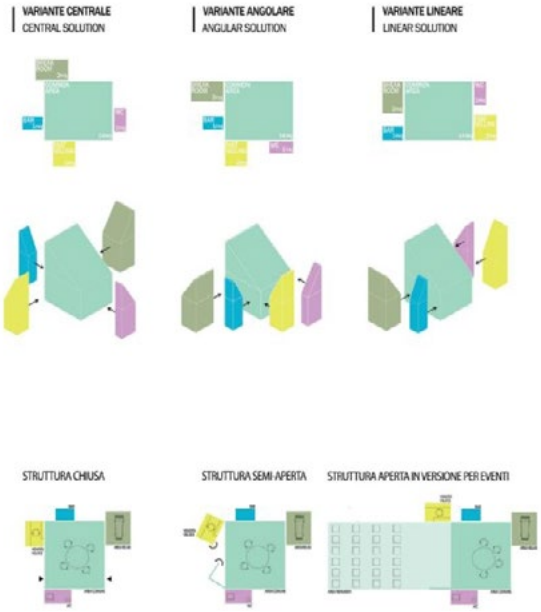

Fig 2. Scheme of compositional flexibility (Gambardellarchitetti, 2020)

Fig 3. Perspective in Milan (Gambardellarchitetti, 2020)

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14 Next Consciousness. Fashion innovative scenarios, processes, and products

Metamorphosis with(in) fashion: futuring through a new fashion design framework

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Abstract

Current global fragility calls for fashion design to embrace and take part in Transformation through Transition to more desirable futures with(in) both physical and digital dimensions of reality. The digital and sustainable transition are trampling these dimensions in a disruptive and mutual way, providing fashion design with a new research landscape.By conceiving a research framework for the advanced design culture in the Transformation Era, the contribution starts from the hypothesis of research of a human-decentered paradigm. Hence, the paper will explore ongoing contemporary transformations with(in) fashion design in both the physical and digital side of reality, discussing the new design parameters and approaches related to wearable products. The aim is to contribute to a broader debate to help develop fashion products able to promote the next consciousness of fashion through more-than human values.

Keywords

fashion design, sustainability, transition, transformation, human-decentered

1. Futuring through fashion

Today, the concept of *limitedness* sounds more familiar than ever: current social, environmental and economic crises, in their multiple manifestations, unveiled the structural fragility of our planet (Rockström et al., 2009). Among the plurality of human affairs, fashion embodies one of the most impactful ones, with its industry globally interwoven into the greater unsustainability of current paradigms (Niimaki et al., 2020). This scenario is getting even more faceted because of the challenges raised by digital transformation and sustainable transition. Here, fashion design is called to reconsider its traditional role towards society, markets and the environment, questioning the forced obsolescence paired with the unconscious production of its products (Cachon & Swinney, 2011) to focus on the next narratives that fashion might tell about its imagined future (McCorkill & Varadarajan, 2013).

Assuming fashion design as a world-making/mythopoetic practice leads us to urgent questions: whose world is going to be designed and who will it be delivered to? Fashion system's unsustainability develops as a layered issue, calling for a new research framework to be properly addressed. The digital and sustainable trajectories are trampling both physical and digital dimensions of reality, triggering mutual transformations. As a result, a new research landscape is emerging, spotted by several *coordinates* through which fashion design is currently reorienting its practice, experimenting new values and designing processes.

Thus, by conceiving a research framework for the advanced design culture in the Transformation Era, the contribution discusses recent experimentations in fashion design aimed at pushing *Transformation through Transition* in both physical and digital dimensions of reality (Pozniak, 2019; Vaccari & Vanni, 2020), which, in turn, affect traditional fashion design paradigms. For instance, *futuring through fashion design* stems from the hypothesis of research of a *human-decentered paradigm*. This is highly relevant

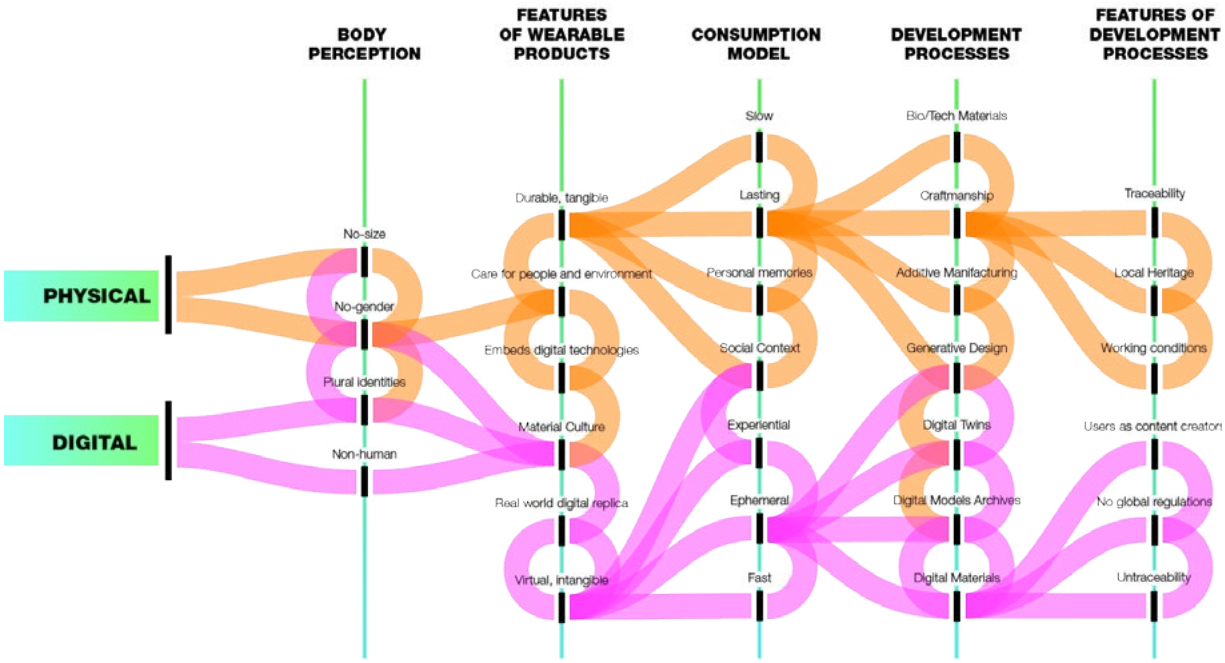

Fig 1. Preliminary framework for the advanced design culture in the Transformation Era.

since it is generating new insights with(in) the design of wearable products. Hence, the paper will highlight how these values will soon affect fashion's production, distribution and consumption models, as well as reshape the modes of representation by and through it. In these new dimensions, fashion can address new narratives by investigating the role of non-human-factors through more-than-human design approaches. The aim is to contribute to a broader debate that helps to develop the next designing direction for fashion aiming at conceiving products able to trigger a new culture and consciousness of fashion by interpreting contemporary transformations.

2. Fashion between physical and digital side of reality

The research framework provides fashion design with new coordinates – identified as *futuring through fashion design* –, which have been experimented and tested through design. At a first glance, the framework relies on a radical shift in focus compared to the approaches traditionally related to them. In fact, it seems that fashion design practice is undergoing a sort of "relational turning point" by not assuming the centrality of the human in the design processes, but focusing on the complexity that surrounds human beings and things (Smelik, 2021). A plurality of interdependent relationships emerge, resulting in tangled lines influencing each other mutually. In this sense, the very concept of "humanity" as we know it falters, with its profile appearing far more blurred than expected.

Reference is made to what Laura Forlano (2017) discusses as the emergence of "the hybrid figure of the posthuman – and related concepts, such as the non-human, the multispecies, the more-than-human, the transhuman and the decentering of the human – [which] greatly expands our understandings of the multiple agencies, dependencies, entanglements, and relations that make up our world". The blurring of the human concept actually reflects a much wider extension, which embraces the entire perception of reality, both in its physical and digital component. Hence, the paper will explore these two dimensions considering, however, that they cross, overlap and influence each other seamlessly.

As for the physical world, digital fashion designers deal with new cultures, environments, social narratives, as well as new tools and materials. For instance, no-gender and no-size are a distinctive element of dresses as interpreters of Gen Z's society, in which gender identity is no longer related to consolidated profiles (Akdemir, 2018). Further sources of transformation can be found in environmental

Fig 3. Anouk Wipprecht, Spider Dress (Jason Perry photo, 2015); Tony Maticewski and The Fabricant, The Animation Overcoat (The Fabricant, 2021).

catastrophes and increasingly exasperated living conditions - global warming, air pollution, pandemics - which have slowly marked common imagination with the need to intervene on the fragility of one's own body, in order to feel safe in the intimacy of one's own identity. This encouraged a series of experimentations which frame fashion design as the activity to conceive and develop *wearable products tout court* (Hrga, 2019), taking advantage of the latest technological advancements: in this sense new fashion products are not only sewn, but also 3D printed, assembled, welded (Bolton, 2016; Smelik, 2018). The work from Anouk Wipprecht (Cass, 2016) will be taken as a reference to present a series of projects that, in the same wake, combine robotics and nano-electronics, making fashion an experience that transcends mere appearances through products that augment the human body. In fact, the resulting garments gain the ability to facilitate and augment the interactions we have with ourselves and our surroundings, suggesting the challenging contribution of fashion in designing more-than-human proximity. Other than handheld devices, such experiences reshape the individual dimension and its spaces of expression through fashion, triggering new ways to interact with the world around us.

Moreover, the theme of fragility extends even beyond the individual sphere. As explained above, the social and environmental impact linked to current industrial and economic models underlying fashion products has exposed the planet to an endemic fragility. This calls for a change of direction, so that fashion products should result from design processes paired with models of production, distribution and consumption that embody a sense of care while choosing and processing raw materials, ensuring the well-being of workers and the protection of the environment (Fletcher, 2017). Therefore, a "conscious wave" in fashion seems to grow, nurtured also by the change in consumers' perspectives and behaviours, who are looking for more durable garments and transparent processes (Amed et al., 2020). However, the latest developments in the digital world are also contributing to this, laying the foundations for new virtual markets (Pozniak, 2019; Heim & Hopper, 2021).

The development of digital media – ranging from virtual and augmented reality for cutting-edge customer experiences to virtual avatars to enter virtual social spaces – inspired new design approaches, as well as new production and consumption models that are easily encountered in the growing concept of *digital couture* – exemplified by the work from virtual maisons like Tribute Band and The Fabricant (Särmäkari,

2021). Recent experimentations with NFTs, *skins* and digital garments highlight the new opportunities offered by virtual commodities for digital spaces like *Animal Crossing*, *Roblox* or even *Zoom* (Gibson, 2021). Since digital media are means for the individual to imagine, construct and convey a highly personal value, they enable new forms of fashion practice, which is now strewn with nonhuman avatars and clothing that defies gravity. Gucci and Burberry models with alien features on the one hand and the impossible geometries of The Fabricant's clothing on the other, make it increasingly evident that the metaverse is becoming the space for unconstrained experimentation with(in) fashion. Here, fashion develops new aesthetic languages to portray a dis-embodied humanity: the power of the digital turn in fashion can be found in the possibility to design a whole world of preference in which one's own image and narration can be designed and experienced as *digitally materialized*.

3. Designing with(in) more-than-human materialities

The trajectories discussed so far portray the layers of the ongoing Transformation Era, experienced through a change of perspective from different points of view, faceted as fashion itself: *Design and Production*, *Communication and Marketing*, *Culture and Society.* The digital and sustainable transition have been shaping these three dimensions in a disruptive way, so that fashion designers have new roles to play in the designing process, relying on a wide variety of digital tools which can be used and managed simultaneously. In this sense, designers are beginning to handle more-than-human materialities. From raw materials like cotton to smart materials like digital films and materials made of chains of biological elements, from the intangibility of digital fabrics to the tactility of advanced textiles: handling more-than-human materialities requires a dynamic concept of life in which human bodies, fibers, fabrics, garments and technologies are inextricably entangled. Designers have historically been asked to conceive the "new material asset of society" and today, by thinking with/through/by more-than human materials, they are encountering new design parameters and approaches related to wearable products, provoking a metamorphosis that could be read as the foundations of a next consciousness for fashion and the new meanings of dress.

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DENIM_DECONSTRUCTION
Industrial garments/random garments. Up-cycling processes

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Abstract

"Deconstructing roughly means 'disassembling' the world in order to show and highlight its formal structures, hierarchical constructions, and potential mechanisms of signification that are interpreted and reconfigured, taking on new images, figures and appearances" (Persico, 20016). This is a way of conceiving acting on the world that began with the experiments and languages of the 1990s, but which today finds new strength in the possibility of declining no more and not so much in aesthetic terms, but in response to ethical issues and environmental protection, those concepts of re-cycling, up-cycling, re-use that are basically inherent in that action of disassembly-destruction and reassembly that is the premise of deconstructivist thought. The case study presented here is an explicit application of the concept of 'deconstruction' to a case of up-cycling applied to a particular objet trouvé: denim.

Keywords

Deconstruction, up-cycling, re-cycling, randomness, denim,

1. Deconstruction. Semantic shift

Since the 1970s, when Jacques Derrida translated into 'deconstruction' the Heideggerian invitation to the *destruction* of Western metaphysics concepts, the semantic shift of the term towards broader areas of thought has gradually facilitated a certain pervasive diffusion of the idea of deconstruction, understood as a strategy of investigation, in the wide horizon of cultural studies and in those territories of knowledge devalued by "high" culture (cinema, television, comics, pop music, fashion). Derridà himself speaks about it not as a 'method' but as a strategy of reading classical texts aimed at highlighting the gaps, the voids, the fractures, the discontinuities, the aporias, and it is he who shows on several occasions how deconstruction can affect any object of culture, and not only metaphysical texts. It is therefore not surprising that the process of 'dissemination of meaning' - which is an integral part of the concept of deconstruction - has since then invaded wide areas of creative thought, finding resonance in some contemporary concepts and in some strategies of the project that are its expression. "Deconstructing roughly means 'disassembling' the world in order to show and highlight its formal structures, hierarchical constructions, and potential mechanisms of signification that are interpreted and reconfigured, taking on new images, figures, and appearances" (Persico, 20016) This is a way of understanding acting on the world that begins with the experiments and languages of the 90s, that today finds new strength in the possibility of declining not so much in aesthetic terms as in response to ethical issues and environmental protection, those concepts of re-cycling, up-cycling, re-use that are basically inherent in that action of disassembly-destruction and reassembly that is the premise of deconstructivist thought. Therefore, in the dimension of contemporary thought, on the one hand the idea of deconstruction is echoed in a broad concept of 'assemblage', and therefore 'montage', which pervades the entire field of contemporary visual thought from Aby Warburg onwards. On the other hand, the idea of deconstruction seems to support cultured operations of reuse that, both in the field of architecture (think of the consolidated experiments of LOT-EK and their sustainable approach to building through

Fig 1. Pars Destruens. Raw material generation. Jeans in their initial state (top). Disarticulation of seams, fittings and flats (below) - a.a. 2019 Workshop 'Decostrudenim' prof. C. Campos, A. Cirafici; allievi: Raffaele La Marca, Fabrizio Santo, Antonella Ranieri.

the upcycling of industrial objects) and in the field of design, are concerned not only with reusing, but also with 'preserving', in terms of performance, matter and energy in a virtuous cycle of creative use that replaces the idea of deconstruction as a strategy of disassembly, with that of deconstruction as a strategy of 'listening' to the potential and vocations of entire meaning systems, in an operation of over-determination that can reach "invention".
The term deconstruction, then, entered the fashion vocabulary through the audacious and well-known work of designers such as Rei Kawakubo for 'Comme des Garçons', Karl Lagerfeld, Martin Margiela, Dries Van Noten just to name the most important ones. Designers who have worked with a creative approach whose results are "unfinished", "disassembled", "recycled", "grunge" garments... creations that break down the various components of fashion and then mix them together, forcing us to reconsider the individual garments in their syntactic structures and the very way in which they are worn. But in addition to being ‘deconstructionist’, this fashion can be called "up-cycled fashion" because it activates a process of reuse in which the cultural value of the material is increased. In fashion, this involves transforming waste or everyday garments into unique haute couture pieces.
Applying a process of up-cycling in the field of fashion therefore means doing what in the world of art Duchamp called the "ready-made": the raw material, used clothing, are the *objet trouvé* with which to work and produce new meaning. Recently these same concepts have found in the idea of sustainability a strength and an ethical urgency probably totally unknown to the protagonists of the experiences described so far. It is s precisely in this direction, - that is, declining the theme of deconstruction in the key of sustainability and fashion consciousness, - moves the case study that we want to present here as an explicit application of the design concept of 'deconstruction' to a case of up-cycling applied to a particular objet trouvé: Denim

2. Randomness and up-cycling. Syntactic re-organizations

Among the most iconic items of the 20th century, blue jeans hold a special place, carrying a positive message of freedom that continues to connote entire generations around the world. However, today the processing of denim, the special cotton from which jeans are made, is charged with important responsibilities in terms of environmental sustainability. Every year 2 to 5 billion denim garments are made with an expenditure of 70 liters of water, 2.5 kwh and 150 grams of chemicals per garment which, added to the production of fabrics, represent an expenditure of 2600 liters of water per garment (D. Benefatto, 2017). The consumption of raw materials and environmental damage are too high a price for the planet and it is now urgent to think about alternative ways that introduce elements of sustainability and awareness in production processes. Up-cycling is precisely the strategy used for this deconstruction operation that was born as an educational experiment and aims to give new life to DENIM, starting from the valorization and reinterpretation of what we might call the 'semantic treatment' that the fabric received to become a garment; that is, when it was cut, folded, sewn, to become a fragment recognizable as a collar, a sleeve, a pocket, a wrist, a leg. However, deprived of its predefined syntactic meaning the fragment is potentially able to become 'new raw material' (pre-signifying). A 'raw material' that, after all, is able to make these devices (clothes) function and give meaning beyond themselves. In the hypothesized process, the new 'fabric' to work with is represented by the syntactic elements: collar, sleeve, cuff, legs, backs ... deconstructed and reused in new syntactic aggregations. The first step was to recognize these typological fragments. The second step was to patiently disassemble them, separating them one by one, until the pre-existing typology was no longer recognizable. The result is a series of surfaces (fabrics) and a series of more or less rigid lines (seams) whose shape is only a memory of their original typology (fig. 1). The aim of the work was to unite the fragments, following in a precise but not pre-constituted way their forms and their new and unexplored possibilities of connection, without attempting an a priori formal result. The connection mechanisms in such a process are more important than the leading ideas that lead them. More important than the procedures that organize them. The result, surprising in its own way, is a performative textile-architecture, built up from molecules, which organize and aggregate through a process in which it is the 'possible unions' that determine each element, rather than a priori will to generate a form. The irregularity of the fragments, together with a perfect execution, in the search for precise unions, leads to the appearance of new alphabets, new spatialities, new typologies, new conformations and along with them new functions of wearing (fig.2). In such an approach, irregularity and perfection are not antagonistic concepts. They work together for a

Fig 2. Pars Construens. Random re-articulation of fragments. Generation of new typologies. Process in T Shirt (top) Process in Jeans (bottom).

Fig 3. Syntactic Rearticulation. Praxis. The new fragments previously obtained by cutting, are now reunified generating new -and random- spatialities, typologies, conformations - a.a. 2019 Workshop 'Decostrudenim' prof. C. Campos, A. Cirafici; allievi: Raffaele La Marca, Fabrizio Santo, Antonella Ranieri

hands weave a network of possible and impossible actions; they open (or close) options for the future of the project, making the new emerge.
The random condition remains the essential presupposition to activate this process. But it can be declined with different levels of complexity. The fragments may, in fact, be combined in different ways. In a completely aleatory way, following the path of the linear stitching of each outline; or they can also follow a previously developed 'pattern' in the configurative sense of the term, through processes of intersemiotic translations (Campos, 2012). Syntactic diagrams from diverse abstraction fields are used to guide assembly operations. Both methods are open to the emergence of new typologies. The results in both cases are surprising and always new and genuine. Functions are always suggested and adjusted when the garment is ready to be worn, but never before (fig. 3). The emerging alphabet, multiple and dispersed, is now ready to be evaluated and classified into a community of designers and users. It is the discussion at the end of the generation process that gives the design piece a sense, continuity, a final edition. The design process thus opens up to an instance of post-rationalization, evaluation, argumentation, where none of the possibilities are left out of the discussion, and the cycle begins again when the garment comes into contact with other garments, with other cultural, historical, industrial and craft contexts.

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New bio-based textiles productions increasing new circular economy models

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Abstract

Textile Design laboratory, TexLab, of the Department of Architecture and Industrial Design (Unicampania) is focused on the integration of local production chains for the valorization of vegetable biomass for the development of innovative bio-based yarns.
The project From Farm to Clothes intends to highlight new forms of production and consumption by interpreting the recommendations of the United Nations SDG's goal number 12 "Responsible consumption and Production". The project, therefore, defines a hypothesis of development of bio-based textiles from agricultural and forest biomass, through the construction of a territorial network based on the building capacity of innovative processes and projects for local development.
The TexLAB is part of the Textile & Clothing Business Labs (TCBL) community, partner of the European project Herewear within the Work package 7 (Stakeholder community building&servicing); it interacts on the dissemination of results and exchange of models among which, the Lifecycle map for bio-based materials developed by UAL's Centre for Circular Design, adapted the project From Farm to Clothes.

Keywords

Sustainable co-benefits; Industrial symbiosis; Co-creative Farm-manufacture; Biomass resource managment; New textiles approaches

1. Introduction

The local level of waste management can make use of a collaborative model between producers and stakeholders, public and research organizations to imagine a strategy of extended and sustainable co-benefits (Sbordone et al., 2021). At the territorial level, sustainable co-benefits concern the integration into traditional production chains of waste from the predominant production chain, understood as a resource to be enhanced, extending the benefits from one primary sector to another, not immediately related. Both economic and environmental benefits, obtainable from the valorization of production waste, increase considerably by creating the conditions for the configuration of networks of heterogeneous companies, able to promote the exchange of by-products. The reuse of by-products can take place within the same sector or in other productive sectors, making by-products available to third companies, in order to transform old practices into new inputs. The interdependencies thus established arise from the concrete need to manage waste materials jointly or because it is necessary to apply complementary resources or skills to facilitate the reuse of the same in unrelated sectors. At the same time, interdependencies are created because a second actor can use the output stream in another phase of its production cycle. From an organizational point of view, companies engaged in successive cycles of metabolization of waste materials

have a greater degree of interdependence if they are connected to each other. This means a great deal of system complexity as compared to firms engaged in linear supply chain relationships (Ashton, 2008).
Interdependence is not only about production processes, materials, and energy flows, but also about cross-sectoral decision-making and management processes between supply chains (Korhonen, 2018). The companies involved go beyond the concepts of the linear economy by opening up to those of the circular economy: industrial symbiosis fosters the exchange of experiences and by-products to create new open-loop production models (Lessard et al., 2021).
The research *From Farm to Clothes* promotes the creation of bio-based textiles by creating synergies between the fields of design and creativity, activating a series of actions involving local small businesses, environmental production systems, for the development of integrated cross-sectoral strategies. Design operates in the territories as a mediator of New Value Chain Processes, through collaboration with communities, decision makers, stakeholders and resources, translating into results services, experiences and tangible relationships.

2. Farm-manufactures vs circular economy

The textile-clothing industry must be committed to developing projects in line with the sustainability criteria applied to the product and the production process. A significant role is played by the raw materials used, where they come from and how they are processed. Currently, the EU textile industry is more than 90% dependent on non-EU fibers and raw materials. The majority of synthetic fibers, if not already from outside the EU, are produced from non-European fossil raw materials and, as far as natural fibers such as cotton, wool and silk are concerned, they mainly come from non-European countries. The European Textile Clothing Leather Footwear (TCLF) industry needs a long-term strategy that allows the transition from fossil-based fibers to more renewable fibers. Farm-manufacture offers opportunities for: the revival of traditional fiber crops (e.g.hemp); the development of new fiber crops; the processing of feedstock also from agricultural waste or from aquaculture, forestry, food industry (SMI, 2021). The new sustainable textiles are based on the concepts of a new type of green economy: the bio-economy consists precisely in the production and innovative use of renewable biological resources (the so-called "biomass") for the realization of final or intermediate goods and services. Farm-manufacture, therefore, means the creation of a new value chain that produces secondary raw materials from agricultural and animal waste. The fashion industry contributes by giving priority to the transition towards a circular and regenerative system based on the valorization of waste. The final characteristics of fibers from plant biomasses, depend on the specific manufacturing sector; in parallel, recycling is open-loop, that is, the recycling of material goes into processes other than the identified manufacturing sector (textiles) and is started in unrelated manufacturing sectors.

3. Bio-based textiles from local feedstocks

The valorization of agricultural residues as a raw material or secondary raw material in the textile industry promotes the establishment of integrated supply chains in the sustainable development of local economies based on effective and efficient solutions (Autio et al., 2018). Historically, plant fibers such as hemp, linen, and nettle have contributed to the production of yarns in the textile industry. For the past few decades, agricultural biomass, forestry etc., which are considered waste, have been the basis for building local integrated supply chains, which from agricultural biomass, through processing into secondary raw materials or raw materials; from the agricultural producer, to the manufacturing industry, to prototyping (From Farm to Clothes).

Agricultural biomass, forestry, etc., pass from the fields of farmers to the districts that deal with the transformation processes, increasing the textile system with new sustainable alternatives. Many studies show that there are enough agricultural residue streams that can be used by agriculture to produce natural fiber textiles on a large scale. Researchers and experts are examining different types of crops, in different areas of the world to find the most suitable ones for the production of fashion fibers (straw-based textile fiber by Fortum Bio2X; Iroony, a cellulosic pulp, fiber developed by Anne and Charles Reboux).
Farm-manufacture based on the valorization of biomass for the production of innovative textiles, meets the challenges of sustainable fashion by distributing co-benefits at the local level, thanks to the configuration of integrated production chains.
The collaboration between manufacturing and local communities of farmers and stakeholders, will facilitate the transition to a green economy; considering agricultural biomass and raw material availability, increased consumer and environmental awareness of the producer, a new value chain based on valorization, collaboration and co-creation is implemented.

4. Herewear Lifecycle Map for bio-based materials

The EU-funded HEREWEAR project contributes to the creation of an EU market for locally produced circular fabrics and garments made from biocompatible resources. From developing to testing sustainable technologies, HEREWEAR will also work on the production of biocompatible yarns, fabrics, coatings, finishes and dyes. The project aims to achieve a significant reduction in the release of microfibers by retracing industrial processes and enhancing a sustainable circular approach.
Project objectives include the creation of models and databases to support Fashion and Textile Design, demonstrating the concept of circular biocompatibility in prototyping.
UAL's Centre for Circular Design plays a leading role in developing design guidelines for the Herewear project (UAL for Herewear Project, 2021).
The project team collected and analyzed a collection of samples of bio-based materials. The more than 90 references collected represent a range of raw materials and processes, as well as end-of-life trajectories for bio-based materials. The sample collection provides the basis for design-driven understanding to overcome challenges and identify opportunities in bio-based materials in a circular and local context, grounding research in the experience of interacting with materials (Herewear, 2021). Using samples of existing or developing materials, with the support of Herewear partners, the From Farm to Clothes project reworked the Lifecycle Map of bio-based materials, developing a model divided into descriptive categories of the material considered. The model, thus configured, is a working tool to support the phases of research and experimentation, highlighting the transparency of open-loop processes.

5. TexLAB Lifecycle Map for Farm-manufacture Development

The Lifecycle Map for Farm-manufacture Development develops a new open-loop model by identifying new pathways from the categories listed below.
- Research and development of new sustainable yarns from local, new and traditional cultivation to experiment with new fibers. In addition to testing new fibers for new yarns, innovative manufacturing practices are being developed. The fibers and new yarns developed allow to expand the range of existing textiles, increasing the value of the textile supply chain. Moreover, experimental research and technological innovation contribute to the creation of new aesthetic codes in Fashion and Textile [fig. 1];
- *technologies and new applications:* the valorization of supply chains starting from the recovery of local biomasses, involves local actors in the realization of integrated supply chains for the revitalization of abandoned rural areas, activating new relationships. The experimental

Fig 1. Example of production from yarn coming from vegetable biomasses, transformed into fabric in the TexLAB (Sbordone, Amato, De Luca - TexLAB, Università della Campania, 2020-2021)

approach of the TexLAB of the University of Campania [fig. 2] becomes the tool to promote at territorial level the dialogue already established by the GAL (Local Action Group), on the real possibility of strengthening local economies. At the laboratory, products made with digital machines (3D knitting) using innovative yarns are tested. These yarns, at the laboratory have been tested in various applications of the Textile Clothing Footwear Leather *(TCFL) sectors*;

- *eco dyeing and printing:* dyeing and finishing of fabrics in an ecological way can be achieved using natural dyes, through processes with zero environmental impact. Vegetable-based dyes and natural pigments are the basis of the Natural Code, tested in TexLAB; a model that outlines new color codes, to be adopted as a reference in the Textile Clothing Footwear Leather sectors *(TCFL).*

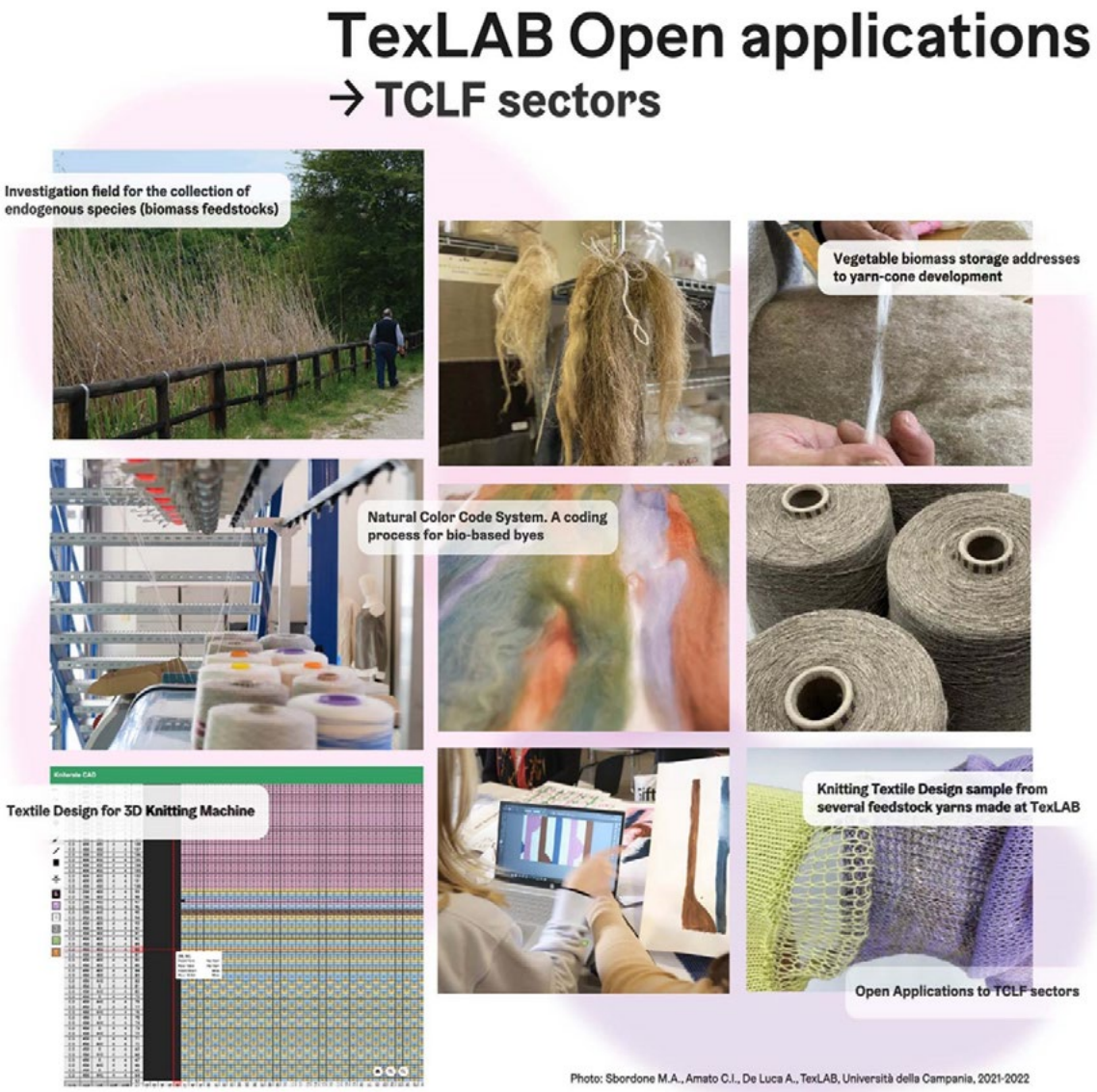

Fig 2. TexLAB Open applications from biomass collection to final open applications for TCFL sectors (Sbordone, Amato, De Luca - TexLAB, Università della Campania, 2020-2022)

6. Conclusion

The research From Farm to Clothes promotes the creation of bio-based textiles creating synergies between the fields of design and creativity, activating a series of actions involving small local businesses, environmental production systems, for the development of integrated cross-sector strategies. TexLAB plays a leading role in the promotion of activities aimed at the development of innovative applications for the sustainable fashion industry.TexLAB identifies opportunities in the use of bio-based materials through farm-manufacture paths; the local context involves unrelated supply chains, communities of practice, decision makers, stakeholders defining the appropriate use of resources according to the methodology of design for territories, translating into tangible results services, experiences and relationships; using

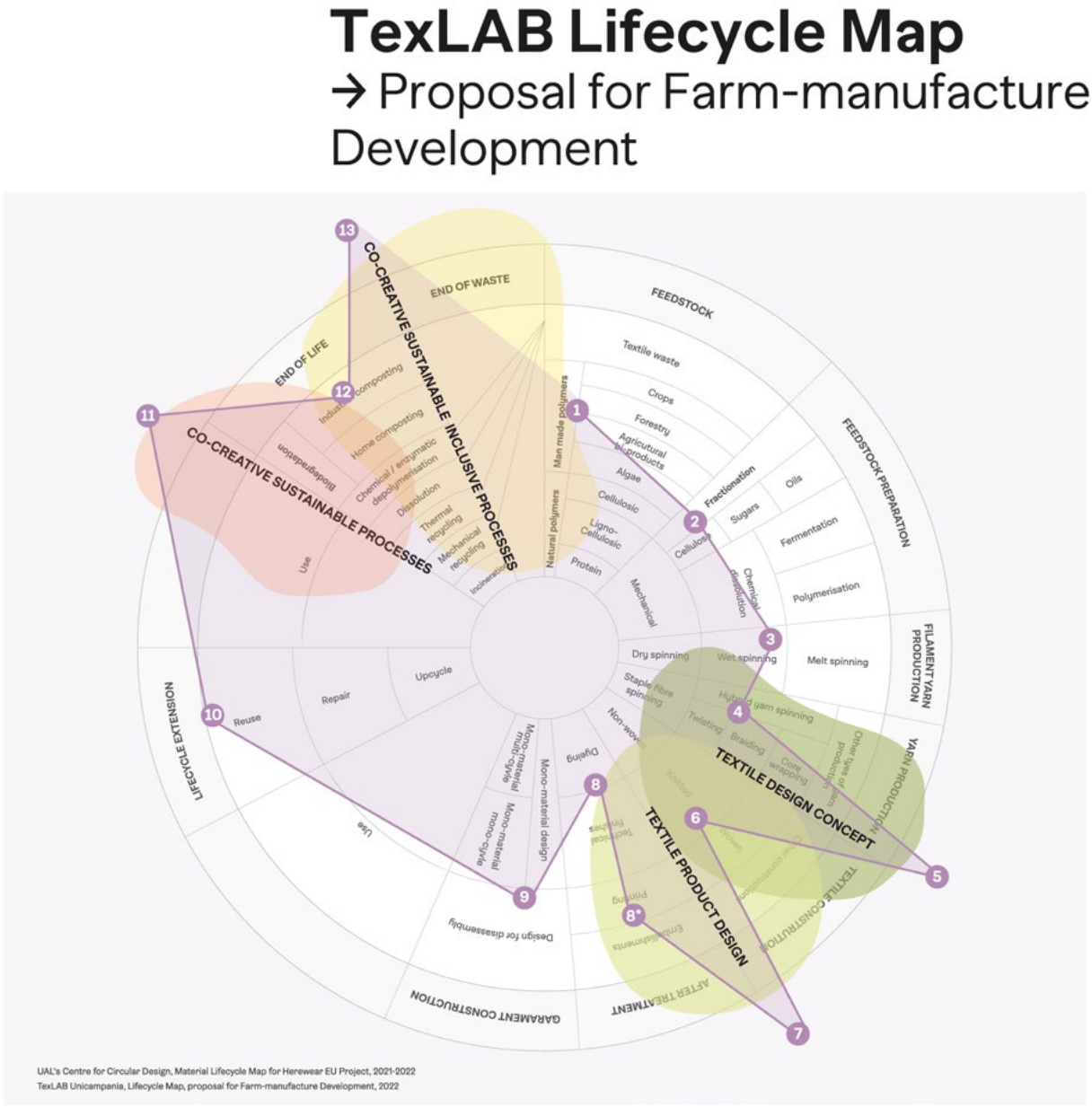

Fig 3. TexLAB Lifecycle Map, proposal for Farm-manufacture Development (Sbordone, Amato, TexLAB, Università della Campania, 2020-2022)

the Design Oriented approach in the re-organization of value within the New Value Chain Processes. Using the Herewear model, the “From Farm to Clothes” project has revisited the Lifecycle Map into a new one Lifecycle Map for Farm manufactures proposing integrations and updates.
The model, thus configured [fig. 3] proposes additions to the base model regarding:
- the Textile Concept phase precedes the Textile Construction phase, in a phase we call Textile Design. It is necessary to define stylistic concepts dictated by market trends in the definition of new production processes;
- the Product Design phase replaces the Garment Construction phase. Product Design

requires a defined, complete and long-lasting approach to design by advancing proposals for the Textile Clothing Leather Footwear Goods sectors (TCLF);
- the Co-Creative Sustainable and Inclusive Processes phase replaces the End-of-life phase. The end of life of a product represents a fundamental moment for the development of new projects. The conditions for recovery, reuse, regeneration, repair, reconditioning, recycling, refunctionalization, etc. are made possible thanks to co-creative processes that relate and integrate the design and planning of individual parts and materials and include people, groups, communities and institutions, between tradition, know-how and high education, in a cycle that generates continuous innovation. The future of fashion and textile and clothing industry foresees sustainability as a contemporary design approach in the textile and fashion industry defining new practices related to the Sustainable Fashion Industry. The new value chain therefore promotes the creation of networks in which unrelated sectors, local resources and new technologies adoptions interact in an exchange for the purpose of dissemination of results and defining the co-creative open-loop ecosystem.

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Alginate Materials for Circular Fashion: from Consumptive to Regenerative Systems

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Abstract

With growing attention towards environmental issues and impact of current production systems, research on new materials and processes has broadened significantly, with particular interest for the fashion field, one of the most consumptive industries on Earth. As renewable and circular resource then, algae and its derivatives as sodium alginate, started to be a focus of many design researches and projects. The research, aimed at fabricating and cataloguing a palette of sodium alginate material samples in order to showcase its potential for the textile field, providing a contribution to the growing community of researchers operating in the field of bio-materials. The collection was the result of the combination of both traditional and innovative manufacturing techniques, and explored the material from the technical-productive point of view, as well as from the aesthetic-perceptual one, with the aim of contributing to its diffusion fostering a shift towards regenerative circular production.

Keywords

Biomaterial Research, Sodium Alginate, Algae Derivatives, Circular Fashion, Digital Fabrication.

1. Consumptive systems: unsustainability of the fashion industry

The fashion system is among the main contributors to the environmental crisis which has been putting a strain on the planetary ecosystem over the last century. As the majority of global industries, it is a consumptive system following the paradigm take-make-discard, therefore based on linear growth, resources depletion and waste production. Textiles fabrication is responsible for the 10% of global carbon emissions, more than international flights and marine shipping combined (EEA, 2019; EP, 2020). Besides emissions, it has repercussions on multiple levels as water and land use and deterioration, health and safety, waste production and last but not least labour exploitation, in confirmation that consumptive systems which don't take into account environmental sustainability doesn't care about working conditions or child labour either. Investigations on the textile and clothing industry highlighted how only in 2015 were used 79 billion cubic metres of water (EPRS, 2019). As regards land use and habitat destruction due to conversion to agricultural use, the textile system ranks second after the food one. A large part of such impact is due to cotton cultivations, responsible for huge water consumption (requiring the largest amount of water among all agricultural crops), soil erosion and degradation, water and land pollution, but also forced and child labour (ILO, 2016).
During the fabrication process moreover, textiles undergo several chemical treatments, such as pre-treatment, dyeing, print and finishing. About 3500 substances are employed in this process, 750 of which are classified as dangerous for humans and 440 for the environment (solvents, pesticides, synthetic dyes, cleansers, etc.), affecting soil and groundwaters. Water contamination continues also during the use, since washing synthetic clothes is the primary source of microplastics ocean pollutions (European Parliament, 2020). The fashion industry also produces a high amount of solid waste deriving from fibres leftovers, cutouts and obsolescence. Every year around 90 million clothes are sent to landfills or

incinerated (the main part made of synthetic fibres), and only the 1% is recycled or regenerated. It therefore appears essential to make a paradigm shift which would allow us to move from a linear to a circular system.

2. Algae and bio-material innovation in the fashion field

With the aggravation of the environmental crisis, growing attention has been directed towards the impact of humans' production systems on Earth ecosystem, resulting in exponential growth for research on circular materials and processes. Among the several resources, particular attention has been paid to algae: abundant, available worldwide, fast-growing and requiring way much less land and water than terrestrial plants. Algae can thrive also in the adverse conditions brought by climate change and sea acidification, they are beneficial for the environment fostering the life of many marine species, and essential to life on earth for oxygen production and CO_2 absorption. They have always proven extremely versatile finding application in many fields from food to medicine and trespassing today in the world of materials and design. An example is the work of Viiolaine Buet, who combines material innovation with traditional weaving and knitting techniques, establishing a dialogue "between nature and manufacture" (Buet, 2020). Another designer working with algae is Nienke Hoogvliet with her "Sea Me" project. She first created a rug made of kelp yarn knotted by hand in an old fishing net, then continued the research on seaweed exploring its potential to be turned into natural dyes and yarns. Twenty different species were collected in the Netherlands, showing a broad colour palette reflecting the local natural reserve. Recently, new algae-based companies are emerging as LivingInk from Colorado, producing ink products grown from algae, or AlgiKnit from Brooklyn, producing durable yet rapidly degradable yarns from kelp, one of the most regenerative organisms on the planet, imagining closed-loop product lifecycle models for the textile industry.
The algae derivative Sodium Alginate, resulting from the extraction of alginic acid, a polysaccharide present in brown algae cells, in the last few years has been the subject of several design researches and projects, thanks to the ease of handling and its characteristics which make it of particular interest for the textile field. Once hydrated, it forms a viscous gum used as a thickener or gelling agent in the food, pharmaceutical and cosmetic industry. Making it react with a calcium chloride solution – same reaction used for spherification in molecular kitchen – turns it into a hydrophobic, edible material.
The material's water resistance opens up a wide range of applications compared to the majority of hydrophilic bio-polymers. The London-based start-up Skipping Rocks Lab for instance, realised "Ooho" as an alternative to plastic bottles, edible bubble made of a thin sphere of alginate encapsulating drinking water. FabTextiles instead, cross-disciplinary education and research platform for experimental and digital open source couture, developed a collection of clothes and bags made of an alginate and coffee grounds bio-composite. The designers Susana Jurado and Elisenda Jaquemot, also experimented with organic waste and waterproof bioplastic in FabLab Barcelona, using alginate and orange skin to make biodegradable clothing and accessories as the "Squeeze The Orange" raincoat.

3. Alginate Materials Samples Collection

Design research has been exploring alternative solutions provided by circular materials and processes. In particular, the paper illustrates an applied research activity carried out in SAPeri&co, research and service centre of Sapienza University, aimed at manufacturing and cataloguing a palette of sodium alginate material samples in order to showcase its potential for the textile field. The collection born from this experimentation demonstrates how important it is to deal scientifically with the topic, experimenting with traditional processing techniques as well as with new ones such as laser cutting or filament extrusion. The experiments started from four different base recipes, collected from open source design databases. The recipes differ mainly in the density: by varying the proportion between water and glycerine it has been possible to control the mixture's viscosity and adapt it to the different manufacturing needs.
The collection was structured as follows:

- *Colours*, changing them according to the ingredients used as organic matrix or natural dyes. The use of an organic matrix is also affecting the overall appearance of the material, resulting in more tactile, matte and porous surfaces. On the other hand, the samples realised using liquid dyes

Fig 1. Alginate Materials Samples Collection (Credits: Giulia Colarieti, Supervisor: Sabrina Lucibello, Co-supervisor: Lorena Trebbi)

present a glossy and plastic-like look [fig. 1].

- *Fibres*, used to reinforce the material, ease the sewing and change the material's aesthetic-perceptual features. In order to keep the material compostable, the fibres used must be natural and raw, which means they didn't undergo any chemical treatment. Of particular interest is the use of waste fibres resulting from the spinning process.
- *Textures*, realised by casting the mixture on several moulds, textiles or processed surfaces in order to impress the surface texture onto the sample, as well as by engraving the material with a laser cutting machine.
- *Patterns*, cut out using a laser cutting machine to create geometric, organic and auxetic patterns which can affect the material flexibility and malleability [fig. 2].
- *Processing*, applying some manufacturing textures traditionally used in the textile field as machine sewing, folding and plisse, drapery, gatherings. The alginate samples have also been paired with other fabrics to create reinforcements, an essential part of many garments.
- *Extrusion*, to produce a filament to be used for weaving. After some manual experiments with syringe, a clay 3D printer was used to turn the alginate mixture into a long yarn, providing constant pressure and velocity.
- *Textiles*, obtained by weaving the filaments obtained to turn them into a textile, as happens with traditional fibres. A small manual loom was used to create the textiles samples, mounting a cotton warp and sodium alginate weft threads [fig. 3].

Fig 2. Alginate Materials Samples Collection: textures & patterns Collection (Credits: Giulia Colarieti, Supervisor: Sabrina Lucibello, Co-supervisor: Lorena Trebbi)

4. Conclusions

The collection is meant to be a tool for dissemination, but also a tool to support designers and producers in the application of the material. The research was grounded on the approaches of learning-by-doing and action research, highlighting the central role of experience as a tool for knowledge building. It was focused on a hands-on experimentation which allowed the designer to get acquainted with the material, understand its behaviour and learn how to interact with its features. The methodology used was then the result of a hybridisation between the complementary approaches of science and design (Trebbi, 2021; Carullo et al., 2017), learning from science to be able to provide accurate data collection and repeatability, but never losing the design inductive perspective, able to shift our view from micro to macro and provide an overall understanding integrating in the project technical, cultural, social and environmental aspects.

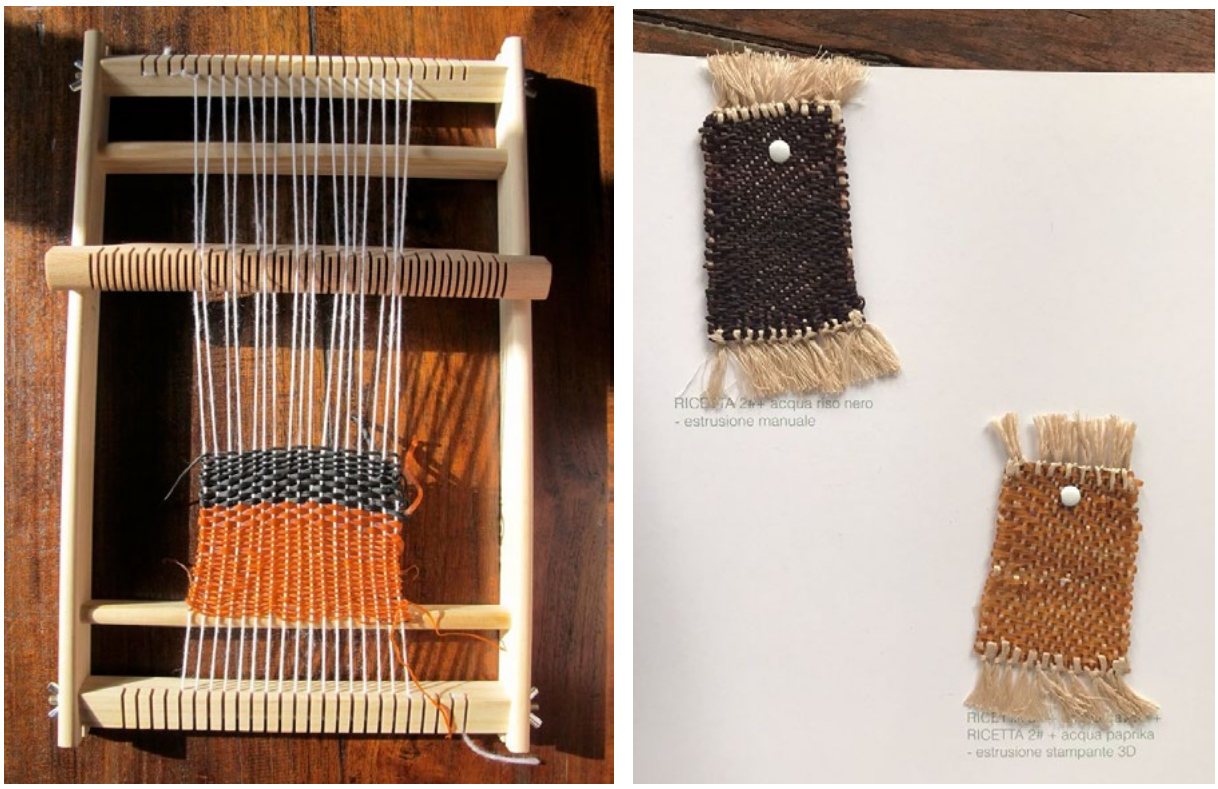

Fig 3. Alginate Materials Samples Collection: textiles Collection (Credits: Giulia Colarieti, Supervisor: Sabrina Lucibello, Co-supervisor: Lorena Trebbi)

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Smart jewels for inclusive fashion

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Abstract

The fashion industry has long neglected disability. However, the recent emphasis on inclusion, diversity and sustainability opens new scenarios for fashion that has a unique opportunity to cast disability in new, creative and more ethical terms. In this paper, we reflect on the troublesome relation between fashion and disability, and the stigmatisation and erasure of people with a disability from the fashion discourse. We focus on the design of medical accessories that is dominated by a medical model of disability that neglects the hedonic aspects of people's experience in accessorising the body. Most of the medical aids for physical or perceptual impairment seem not worthy for fashion consideration. The paper reflects on the design of hearing aids and describes the case study of smart jewels that recognise and notify deaf people of surrounding sounds. The jewels are designed as fashion accessories and "objects of desire" rather than as devices to compensate for an impairment.

Keywords

Disability, fashion, inclusion, social sustainability, smart jewellery

1. Introduction

Sustainable fashion has received growing attention in recent years. The concept is multifaceted, being related to fashionable clothes that combine the principles of fair trade with sustainable working conditions, without being at the same time harmful to people, the environment or the workers (Joergens, 2006). However, for fashion to be truly sustainable it must be inclusive for people of all body types, including bodies experiencing limited mobility or impaired skills.
Even if the fashion industry has made some steps ahead to becoming more inclusive by targeting a wider spectrum of genders, ethnicities and cultures, the current prevailing model of fashion still excludes various groups of people, focusing on certain categories and marginalising others. In this model, people with disabilities are mostly ignored by the fashion industry and seldom get the chance to be valued as stylish and elegant. Inclusion should be regarded not just about healthcare, housing, transport, and services. Identity, self-expression and self-worth and the ways of expressing them are equally important human rights to protect and guarantee.

2. Functionality versus style

To understand the relation between fashion and disability it is important to clarify how disability is framed and how the representation of impaired bodies impact the fashion production and retail systems.
In the scientific literature (Shakespeare, 2006), two main models of disability are debated: the medical and the social models. According to the medical model, disability is an individual characteristic, a defect to correct and normalise. This view perpetuates the "normal / abnormal" binary, conceiving people with disability as deficient or lacking in comparison to "regular" human bodies and minds.

The social model of disability developed in the latter part of the twentieth century. In this model there is a fundamental shift of responsibility from the individual to the social context. Disability is seen as a social construct, given by society's inability to provide adequate services to ensure the needs of disabled people. According to this approach, it is not the disabled person that needs to be corrected, but rather the systemic barriers, the stigma, and social exclusion.
The paradigm shift from the medical to the social model of disability also impacted the perspective on disability in the fashion industry. Rather than assuming that disabled people cannot wear certain clothes because of their impairments, designers are required to conceive garments that consider mobility, sensory or cognitive challenges. However, the choice of clothing cannot be limited to practicability. It should be a vehicle of expressions of social identity and personal sense of style.
In 2006, the Convention on the Rights of Persons with Disabilities (UNCRPD) acknowledged clothing as important as food and housing, recognising its crucial role to ensure social and economic inclusion, as well as equal opportunities. Notwithstanding the cultural shift promoted by UNCRPD, people with disability are still prevented from engaging in activities like banquets, weddings, funerals, gym classes, due to the lack of garment and footwear options (Kabel, 2016).
Cavagnero et al. (2018) explained the slow progress in disability fashion from two oversights. The first one is that disability is not considered aspirational enough for fashion, and the second that disabled people's needs are not met as they are not seen as potential customers.
In what follows we present a case study on the design of hearing accessories for deaf and hard-of-hearing people.
The study is articulated in two main parts: a scoping literature review and a digital ethnography aimed at exploring factors affecting the acceptance and long-term adoption of hearing aids; and a series of co-design workshops involving a group of deaf and hard-of-hearing people with the objective to design hearing aids as fashion accessories to meet aesthetic needs and sense of style of the wearers.

3. Scoping literature review

A scoping review of the literature was performed on 3 databases, ACM Digital Library, IEEE Xplore, Scopus. The keywords used for the search were: deaf AND assistive technolog* OR fashion AND design AND experience AND aesthetics.The year of publication ranges from 2000 to 2022. 154 records were identified and screened, and 16 records were included in the analysis [Tab.I]. The inclusion criteria were: a) the record is written in English; b) the record is a journal paper, conference paper, book or chapter; c) the record provides a perspective on the topic or a case study about wearable accessories to enhance the experience of deaf people and/or hard of hearing people.
Results reveal that the use or abandonment of hearing aids varies on meeting self-image and self-esteem needs of hearing-impaired people. Their adoption mostly depends on cultural factors and on the personal meaning associated with the devices.
Manufacturers of hearing aids seem to underestimate the effort necessary to design aesthetically appealing devices which address a personal sense of style and cultural beliefs. Hearing aids address the impairment from a functional viewpoint and are brought to market with a minimal consideration of the cultural meaning, social impact, stigmatisation and design aesthetics which are fundamental to address the experience of accessorising and clothing the body (Pullin, 2009).

4. Digital ethnography

A digital ethnography study was performed on 3 English and 2 Italian Facebook groups whose members are deaf and hard of hearing, by selecting posts and discussions about wearable devices and fashion. Compared to the scoping review that allowed us to investigate the topic as it is documented in the scientific literature, the digital ethnography allowed us to understand the experience of deaf people as they share their personal opinions in their online communities.
A lively debate regarded hearing aids that are small, discreet and can be easily concealed. This design meets the need of some people to avoid the stereotypes associated with hearing loss, such as being perceived as weak, old, or not competent. However, some people argued that invisible devices with no

Tab I. Number of records identified, screened and included in the analysis

Identification	Screening	Inclusion
Records identified through database searching N = 154	Records excluded after abstract reading N = 100	Records excluded after full text reading N = 36
Duplicated records removed N = 2		
Total records identified N = 152	Total records screened N = 52	Total records included N = 16

sense of style or gendered design might reinforce the assumption that hearing loss and the use of hearing aids are stigmatising and should be hidden.
Several posts addressed the aesthetics of the device welcoming the transformation of hearing aid as a body adornment. Online discussion groups share ideas, tips, and examples on ways to custom hearing aids and cochlear implants using various materials and techniques, aiming to transform the device into a fashion garment (Profita et al., 2018).

5. Co-design workshops

A series of co-design workshops were performed during the EU funded project “Quietude” (www.quietude.it) (Marti & Recupero, 2019; Marti, 2021). Deaf people were engaged in envisioning hearing aids as smart jewels able to filter and recognise sounds of interest and notify the wearer of their occurrence in the environment [fig. 1].
Jewels including necklaces, armbands and bobby pins were designed using leather, felt and recycled plastic [fig. 2]. Instead of using precious material, recycled and inexpensive materials were preferred to address sustainability (Blevis, 2007).
Their looking was sculptural and striking, and the wearability belied a sophisticated technology that allowed the jewellery to translate sounds into shape changes [fig.2], light patterns and vibrations, letting the wearer perceive sounds via their body. The jewels were modular and could be assembled in different configurations selecting modules that vary for materials and embedded electronics (modules for vibration, light and shape change). They were connected to an app that allowed to record a personal library of sounds of interest, and to display the recognised sound in addition to the embodied notification provided by the jewel [fig.3].
The design was received as playful and attractive also for hearing people. In fact the project was exhibited in 2021 at the Ulm museum (Germany), and in a series of design venues including Dutch Design Week (Eindhoven), Ars Electronica (Linz), Future Fest (London).
Testing sessions revealed that people have a strong emotional relationship with jewellery which act as means to adorn the body and express personal identity (Wallace & Dearden, 2005; Donohue, 2014). If we design beautiful hearing aids that people are delighted by, they are more likely to use them and be proud of wearing them.

Fig 1. Co-design workshop: co-creation with a deaf student (© Quietude, Santa Chiara Fab Lab, 2022, all rights reserved)

Fig 2. Smart necklace: eco-leather, 3D printed joints and embedded electronics allowing sound notification through shape change (© Quietude, Santa Chiara Fab Lab, 2022, all rights reserved)

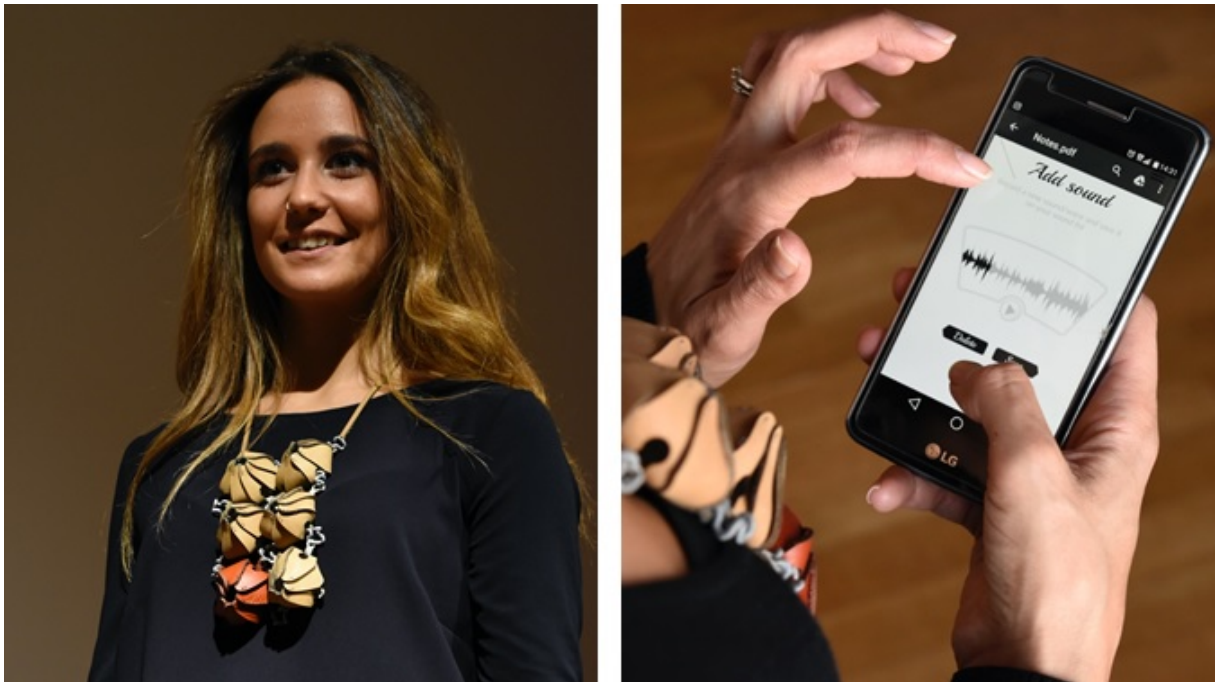

Fig 3. (left) Smart necklace, (right) the app connected to the jewel (© Quietude, Santa Chiara Fab Lab, 2022, all rights reserved)

6. Conclusions

Apparel for people with special needs is perceived as a niche market, which attracts low levels of investment by major brands (Cavagnero et al., 2018).
Designers of clothes and accessories for disabled people must confront new challenges to contribute to a new generation of inclusive fashion. They must learn about body mechanics and perceptions, material properties, basic psychology and aesthetics, cultural beliefs, to make these features compatible with the needs, potentialities, and limitations of skills of all users, including disabled people. The smart jewels described above show a new generation of garments, combining aesthetics and style and interactivity (Tsaknaki et al., 2015; Versteeg et al., 2016), designed not only for people with a disability, but rather as fashion lines that are inclusive, attractive, playful for anyone, regardless of whether they have an impairment.

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Platforms, algorithms, and new media in the prosumer era. The evolution of tailored production in Fashion and Cosmetic field

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Abstract

The paper aims to analyse the evolution of the fashion system, with particular regard to the digital dimension of production and purchase channels, focusing on the transformation of the manufacturing processes, consumer involvement and customization strategies, during the last decade.
In the fashion and cosmetic fields, the consolidation of strategic actions linked to environmental, ethical and social sustainability allowed to involve the consumer in various stages of the design and production process. The implementation of digital services for production and retail is supported by digital platforms and technologies that transform the purchase in shops and online into an expanded experience, while the corporate communication focuses on the narration of values linked to the conscious fashion, raising awareness of purchases and interest in the environmental impact of the fashion system.
Through the selection of case studies, the essay highlights the current consumer engagement scenarios in Fashion that support phenomena such as the hyper-personalisation of products, Do it yourself, made-to-order and second-hand purchases.

Keywords

Sustainability, rethinking processes, consumer awareness, prosumers, expanded experience.

1. Introduction

In the fashion system, the directions of change adopted to involve the consumer in the creative process concern the production models, business strategies and supply chains. At the same time, the capability of brands to involve and share choices linked to their philosophy and values, especially relative to sustainable strategies, supports strengthening and connecting the productive process, communication and purchase experiences.
Controlled supply chains, low-impact production processes, re-use and recycling of waste materials, and eco-oriented packaging are only a few actions that companies of the fashion system introduced over the years about sustainability. Over time, the complexity of the multi-level actions of design for sustainability led to experimenting with production and sales models that integrate the environmental, ethical and social dimensions of sustainability, conveying innovative conscious fashion experiences. Phenomena such as the *hyper-personalization of products, Do it yourself, made-to-order and second-hand purchases*, widespread in a global and increasingly way, show that we are witnessing sustainability processes that explore new ways of production, distribution and selling and more conscious purchase behaviours. The personalization strategies of fashion products, started in the 1990s, especially by sportswear companies, focused on the possibility for the consumer to modify the parameters determined by the company (colours, textures, details), but today customization concerns the manufacturing and sales process, as well as the product.
Thanks to the use of apps and platforms, realized to support the customer consumers purchase, are developed 'tailor-made' products with specific functionalities – through made-to-order production processes, that optimize materials, manufacturing and storage times – conveyed on sales channels that propose immersive experiences and gamification strategies.

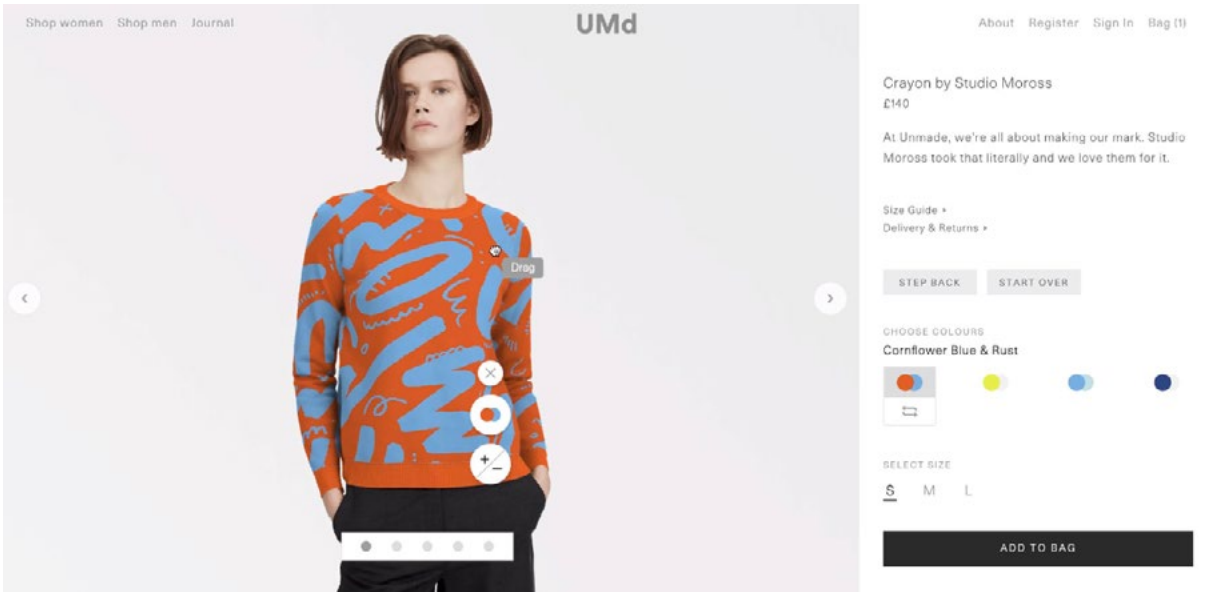

Fig 1. UnmadeOS provides the digital infrastructure needed to enable a demand-driven apparel industry and enables fashion and sportswear brands to transform product development, product design & manufacturing in a personalised way. (Unmade website www.unmade.com/unmade-os/, 2022)

According to the 17 Sustainable Development Goals 2030 (SDGs 2030), defined by the United Nations in 2015 as part of the global agenda for sustainable development, involving consumers is a valid tool for companies to measure their performance in terms of sustainability and to raise awareness among the stakeholders of the fashion system. Numerous awareness-raising initiatives invest in the educational, strategies and manufacturing fields of Conscious Fashion such as *SDGs for Better Fashion*, which involves students, companies and consumers whose purpose is "to tackle the environmental and social issues related to clothing production and consumption".
In this context, the *prosumerism* phenomenon (Toffler, 1980), allowed observing the transformations of society and to strengthen the relationship between companies and consumers by involving them actively in fashion creative processes.

2. Do it together, customisation practices and strategies for product life cycle extension

The *prosumerism* phenomenon is evolving rapidly, also influenced by the pandemic and the consequent change in lifestyles, which increases the time spent using digital devices and platforms.
The evolution of the digital ecosystem in the fashion industry, driven by Do It Together (DIT) approaches, the search for new consumer shopping experiences and the rise of online sales have increasingly driven companies to offer a unique shopping experience and tailor-made products that meet the needs of each customer. The pandemic has pushed online sales and caused an evolution of digital services. Indeed, in 2020, European e-commerce increased by +10% compared to 2019 (European E-commerce Report, 2021). The way in which people shop online is changing, encouraging the phenomena of "re-selling" or "pre-owned", which combines two sustainable strategies, of extending the life of products and reducing production and its consequent impact. Thus, from the purchase of a garment or an accessory, the market moves towards the definition of new shopping experiences.
This is demonstrated by the success of startups such as *DressYouCan* and *DrexCode*, which offer reselling services, but also platforms such as *Vestiaire Collective* and *Vinted*, whose customers have access to a service for selling and buying second-hand clothes and accessories in a global network. The online shopping experience is driven by advanced technologies such as 3D configurators, body scanners and virtual try-on devices, which change the concept of handcrafted tailoring and provide new

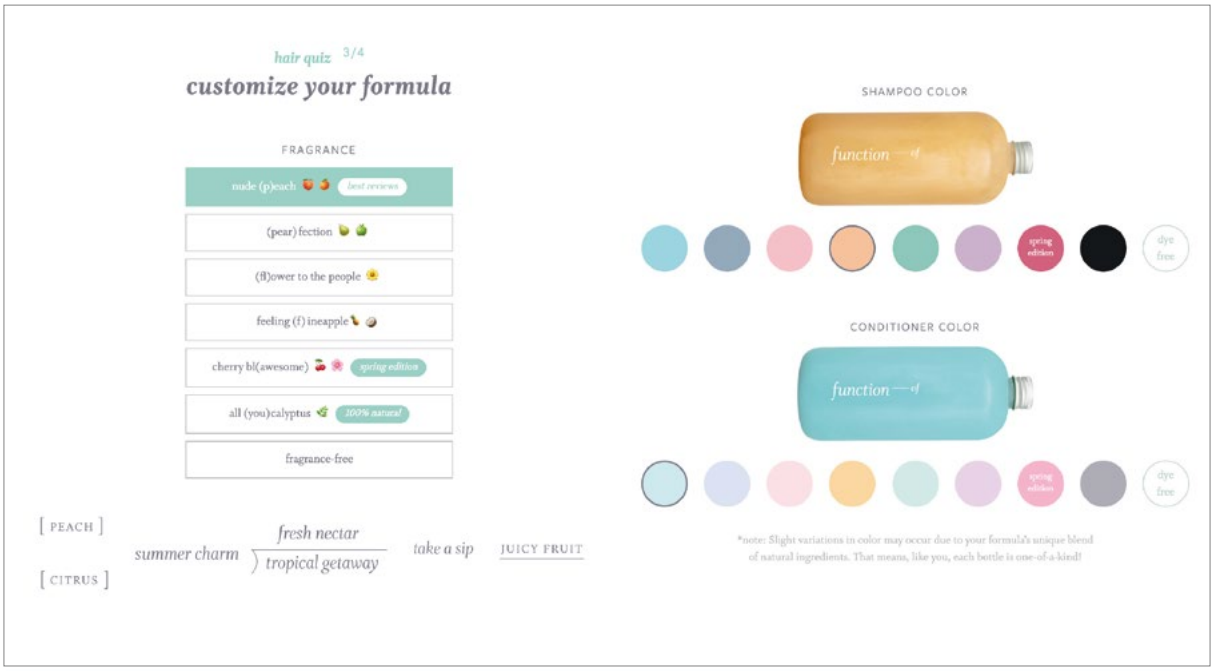

Fig 2. Function of Beauty, a customizable beauty brand for hair, skin, and body care products guided by algorithms. (Function of Beauty website www.functionofbeauty.com, 2022)

services for product customisation, generating a new relationship between companies and consumers. Physical stores are also supported by elements of virtual experience, such as interactive in-store devices, virtual fitting rooms guided by augmented reality and the possibility to see online content in shops, through QR codes.

Therefore, production systems become highly flexible, allowing companies to offer tailor-made services and to customise mass-produced products and industrial garments according to the needs of the individual (mass customisation), through the use of codes and IT platforms.

Customisation strategies and approaches are applied on different levels, from Made-to-Order, where it is possible to modify fabric, colour and size according to standard parameters, to Made to Measure, which can modify an existing model not only in terms of colour and size but also in the details of the garment, up to the Full Bespoke concept, which consists of creating a completely new and unique model, allowing the user to choose fabrics, fitting and customising the garments completely. Collaboration between companies and consumers, oriented to establish peer-to-peer communication, is able to satisfy necessities and address human needs. Today it is proposed as a tailored experience of hyper-personalization, that integrates active and creative participation in the on-demand manufacturing of the product.

Two international experiences, Unmade and Function of Beauty, synthesise this approach and introduce two models of product customisation, involving the consumer actively and innovating production processes in the knitwear and cosmetics sectors.

The company Unmade represents a manufacturing model applied in the knitwear sector. It is based on cloud and web design able to create a platform for customization that enable large apparel companies to create personalized, on-demand products in their manufacturing facilities. UnmadeOS software is a tool that allows users to configure and customize products by changing many parameters (style, colours, patterns, components, text) and offering a hyper-segmentation of products [fig. 1].

The consumer, through the use of an intuitive interface, works in real-time on the garment and makes his choices by sending it to production.

Since 2015, a similar approach is experienced in the cosmetic field by a company that has introduced a personalization model of cosmetic products in which an algorithm allows the consumer to compose a formulation that responds to specific needs, through the elaboration of parameters and choices.

Fig 3. Good on you, the world's leading source for fashion brand ratings on ethical and sustainable values. (Good on you website www.goodonyou.eco, 2022)

The approach of the *Function of Beauty* brand is to build a process of personalization and consumer loyalty through a cloud system, supported by a community of designers and consumers who contribute to the implementation of product performance, through feedback and active participation [fig. 2].
These two approaches highlight how the supply chains are updating traditional production processes, introducing new forms of active participation of the consumer through the support of crowdfunding platforms, which make possible experimentations not related to market logic.

3. Conclusion

Until a few years ago the interest in eco-oriented products was limited to a small category of consumers, who were more informed about environmental issues and sensitive to values transferred by the brand. Today a large group of consumers is aware of production impacts, attentive to the life cycle of the product, and require high-performance garments. They changed their habits in the direction of sustainability, starting from conscious purchase choices. Indeed, they are also involved in the creative process, preferring highly customized products, with longer life cycles compared to approaches proposed by fast fashion brands.
In the last years, the fashion industry shifted its attention to developing digital platforms to enhance consumer awareness through the promotion of values such as transparency, fairness, social justice, respect for human rights and the care to preserve the availability of natural resources. Blockchain technology and algorithms for the traceability of all steps of the brand's value chain are used to evaluate and communicate the sustainability performance of brands.
From the reported cases it emerges that if on the one hand digital tools allow for optimize the production and consumption processes in a sustainable perspective, on the other the consumption choices that follow sustainable production trends must be accompanied by a critical ability of the consumer that can direct him towards the selection of brands that work with consistency and transparency.
Digital platforms such as *Good on you*, makes brands rating about three factors: care for the planet, people and animals to help users to discover the best responsible brands and can drive the whole fashion industry to become more sustainable and fairer [fig. 3]. Moreover, *Sustainable Brand Platform* allows brands to improve their impact on environmental issues at all stages of the values chain, from

allows brands to improve their impact on environmental issues at all stages of the values chain, from raw material procurement to manufacturing processes, from packaging development to logistics management, but also companies' commitment to charitable activities (Asión-Suñerm & López-Forniés, 2020). We are witnessing a process of business strategies transformation linked to digitalization, open software and prosumers, ever more involved in design, production and consumption stages (Aitamurto et al., 2015).

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Seven Bodies.
Parametric design dialogues around the body

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Abstract

The essay explores the possible horizons of fashion-oriented research from a perspective of technological manipulation of the body. Through an intense and critical dialogue series, the body's construction is projected on the border between tangible and virtual to rediscover new expressive possibilities. Specifically, the essay describes the first phase of the Postdigital Manufacturing Processes. Body hacking for productive systems project funded under the VALERE Program at University of Campania "L.Vanvitelli". From an analytical case study mapping phase, the project aimed to experiment with an interactive engagement of a series of focus groups with advanced digital technologies. Through this methodological practice-based research, the essay describes the phase that involved seven international personalities in the fashion and design industry. The cycle of seminars, which lasted six months, was elaborated to have a direct dialogue with some of the most emblematic protagonists of the panorama related to fashion tech. (Toeters, 2020). The meetings contributed to the deepening of the project's themes by introducing new knowledge and technological processes. The second part of the essay illustrates a parametric study aimed at the definition of seven animations dedicated to each lecture. The seven animations, executed through the software Grasshopper, accompany the different dialogues intended as different perspectives around the digital body.

Keywords

Bodies, Parametric Design, Advanced Digital Manufacturing, Design Dialogues, Fashion Tech.

1. Introduction

This contribution describes the first phase of the *Postdigital Manufacturing Processes. Body hacking for productive systems project*, funded under the VALERE Program at *University of Campania "L.Vanvitelli".* The project aimed to industrial experimentation of advanced digital technologies at the border between design, technology, and body through practice-based research. The research, which lasted 18 months, was elaborated through 4 phases: phase 1, analysis and mapping of state of the art; phase 2, design and prototyping; phase 3, open workshops and testing; phase 4, dissemination. Specifically, through a methodological and experimental dialogue series, the essay describes the first phase of the project that, in the light of 50 case studies of independent designers and the involvement of seven chosen personalities in the fashion and design sector. The cycle of seven seminars "Bodies" described lasted six months and was elaborated to have a direct dialogue with some of the most emblematic protagonists of the fashion tech panorama. Each meeting has contributed to the project topics, enriching the previous knowledge and the possible technological processes to adopt.

2. Mapping Fashion Tech

The first phase of the project has involved the analysis and mapping of state of the art through the collection of case studies from the scientific literature, the parametric analysis of the case studies identified, the elaboration of seven specific lectures on the body, the construction of seven parametric animations conceptually linked to each lecture.

The research path started from conspicuous bibliographical research, through both technical-scientific texts, close to new technologies, and more strictly humanistic texts. The heterogeneity of the design-oriented sectors involved (product, fashion, jewelry, accessories) allowed us to reflect on the multidisciplinary nature of the theme of the body.

Due to the quality of the information and the disrupting nature of the research topic, multi-software and algorithmic analysis tools have been adopted to study the technological hybridities identified in-depth. Since the beginning, the research has created an algorithm-based data collection to formulate future scenarios. This database has proved essential for the restitution of trends that allowed to trace the possible evolutionary directions of the body between design and technology.

The survey included the identification and mapping of 50 international designer studios selected through specific criteria and cataloging parameters. Precisely, the guidelines that led to a critical classification of the database were the following:

- Temporal: Design conception after the 2000s
- Semantic: Close relationship with the human body
- Technological: Compresence of several technologies
- Transdisciplinary: Hybridization between several disciplinary fields.

The research has kept the body's central theme, in its double extension, physical and digital. At the same time, the database of 50 case studies (mapping of the State of the Art) was deepened with a cycle of 7 international dialogues [Fig.1]. The cycle of seminars, curated by Chiara Scarpitti and Patrizia Ranzo with the scientific secretariat of Michela Musto and Flavio Galdi, lasted about six months and was developed to openly confront some of the most emblematic protagonists among the 50 selected cases studies.

The meetings contributed to the enrichment related to the project's themes, the knowledge and the possible digital manufacturing processes, and the international network. Each dialogue, recorded and then post-produced to disseminate the project worldwide, was open to an audience not exclusively academic and was designed for the duration of two / three hours (including each time an introduction to the project, a specific lecture, the subsequent debate). The seven seminars, mainly held in English, have involved creative personalities engaged with international Universities and Research Centers. The selected designers come from different countries, such as Iran, Florida, California, Singapore, England, Qatar, and Italy.

Overcoming the traditional oppositions between material and digital, physical and virtual, the dialogues described how design methods and sensibilities could redefine the vision of the human body and its extensions in the relationship between humans and technologies. Technology is understood as an "extensive" potential capable of giving the human being new physical and mental faculties, addressing the technological body's theme within a generative design, digital fabrication, in dialogue with the art world. The occasion proved to be an intense moment of international dissemination that fed the contemporary debate, promoting the project itself.

The body declinations chosen with the seven designers were: Generative Bodies with Filippo Nassetti, Techno Bodies with Anouk Wipprecht, Performing Bodies with Tiffany Trenda, Political Bodies with Giovanni Innella, Prosthetic Bodies with Francesca Lanzavecchia, Inner Bodies with Chiaralice Rizzi, Emotive Bodies with Behnaz Farahi.

Relative to the seven lectures on the body [Fig.2], Generative Bodies described how generative design methods and sensibilities could redefine the vision of the human body and its prostheses. Starting from the idea of postnatural, in overcoming traditional oppositions such as natural and artificial, through a portfolio of projects, Filippo Nassetti describes the technological evolution according to an operative

Fig 1. *Seven Bodies.* Graphic presentation of the seven dialogues around the bodies

method for the creation of new visual languages. His research "Postnatural Design" explores the aesthetics that emerge from the crisis of traditional oppositions such as human and technological, interconnecting organic formations, computational methods, and new media.

The second lecture, Political Bodies, edited by Giovanni Innella, used the exhibition The Life Fair (The New Institute, Rotterdam, 2016) as the central pivot of the talk. From a political and social perspective, Innella presents a series of real and fictional projects, by his own and others, that represent the human body as a battleground between Individual, State, and Industry. The result is not a homogeneous and defined panorama but rather a series of contradictions and conflicts that illustrate plausible scenarios of what awaits us after the Anthropocene.

Instead, Emotive Bodies concerns Behnaz Farahi's lecture that addresses a new empathic approach to environmental design. Traditionally, emotions have been neglected in favor of rationality. On the contrary, the matter has often been investigated only in terms of performance. The matter has rarely been associated with emotions. Emotive Bodies re-evaluates the relationship between emotions and matter, bringing these two aspects together and exploring this dynamic relationship. Delving into computational design and interactive fabrication technologies, Farahi explores the enhancement of an empathic relationship between the human body and its space using highly sophisticated systems. Her work addresses emotion, perception, and social interaction, linked to technologies. (Farahi, Leach, 2017).

The Techno Bodies lecture [fig.3] involves Anouk Wipprecht, who has been working in the field of FashionTech for many years. The Dutch designer combines fashion and design with engineering, robotics, and user interaction/experience design. Fashion becomes interactive while technology has never been so close to the skin opening up the garment to an experience that transcends mere appearances. Wipprecht works in an interdisciplinary way, searching for intelligent systems that interact with the body and the wearer's environment and using machine learning and biomimicry coupled with sensors and animatronics. Her body sculptures move, breathe and react to the world around them. She is interested in new bodily modalities we can interface with, building micro-controlled, intentionally provocative garments.

In Prosthetic Bodies, Francesca Lanzavecchia confronts the industry world by revolutionizing an obsolete idea of equal bodies, homologated needs, and formal perfection. The aim is to introduce humanity, poetry, lightness, and irony in this context. The objects are considered functional, symbolic, and individual

Fig 2. *Seven Bodies.* Emotive Bodies of Behnaz Farahi, Generative Bodies of Filippo Nassetti, Techno Bodies di Anouk Wipprecht

extensions of bodies and souls. For this reason, they always have biographical and autobiographical characters. They tell deeply intimate stories, empathic in their description of human diversity and fragility. Inner Bodies' last lecture intended to put the jewel object back at the center of the project - understood as a possible device for speculative triggers. Chiaralice Rizzi describes the world of contemporary jewelry as an interesting example of body perception and an artistic medium and source of the artist's creative force. In its ability to focus on corporeal existence, contemporary jewelry explores the notion of identity as a quality that operates within and across cultural boundaries.

3. Programming conceptual bodies

The second part of the essay illustrates a process of graphic elaboration relative to the definition of seven animations used within the cycle of dialogues "Bodies." The animations executed through the software Grasshopper are not intended as consequential programming but as a dynamic system set through the definition of an algorithm constituted by a succession of geometric transformations.
Such parameters are expressed through variable sliders: by increasing the value of a parameter, it is possible to pass from configuration A to configuration B, interpolating the intermediate values to generate a sequence of frames. The result is an animation that can be interpreted as the output of a creative process in which the designer has the role of establishing the rules of transformation and evolution. The described technique is suitable for creating dynamic graphics representing movements defined by parametric laws or mathematical functions. In this sense, finds inspiration in real behaviors that unite different aspects of the physical world systematically (Capra, 2016).
Bodies animations use the Voronoi diagram generated from a point cloud. It was possible to create seven different sequences with the cell as a primary element by working on different laws governing their movement. The cells, large and small, evolve each time differently and conceptually according to the lecture they want to introduce. [Fig.4]. The goal is to create a visual link between the patterns generated and the concepts explored in the lectures. The choice of the cell as a primary element is dictated by the approach to the theme of the human body and, more generally, to the assonance between different complex systems (human body, society, politics, technology) sharing the same "structures" and the same behaviors (Gandolfi, 2008).

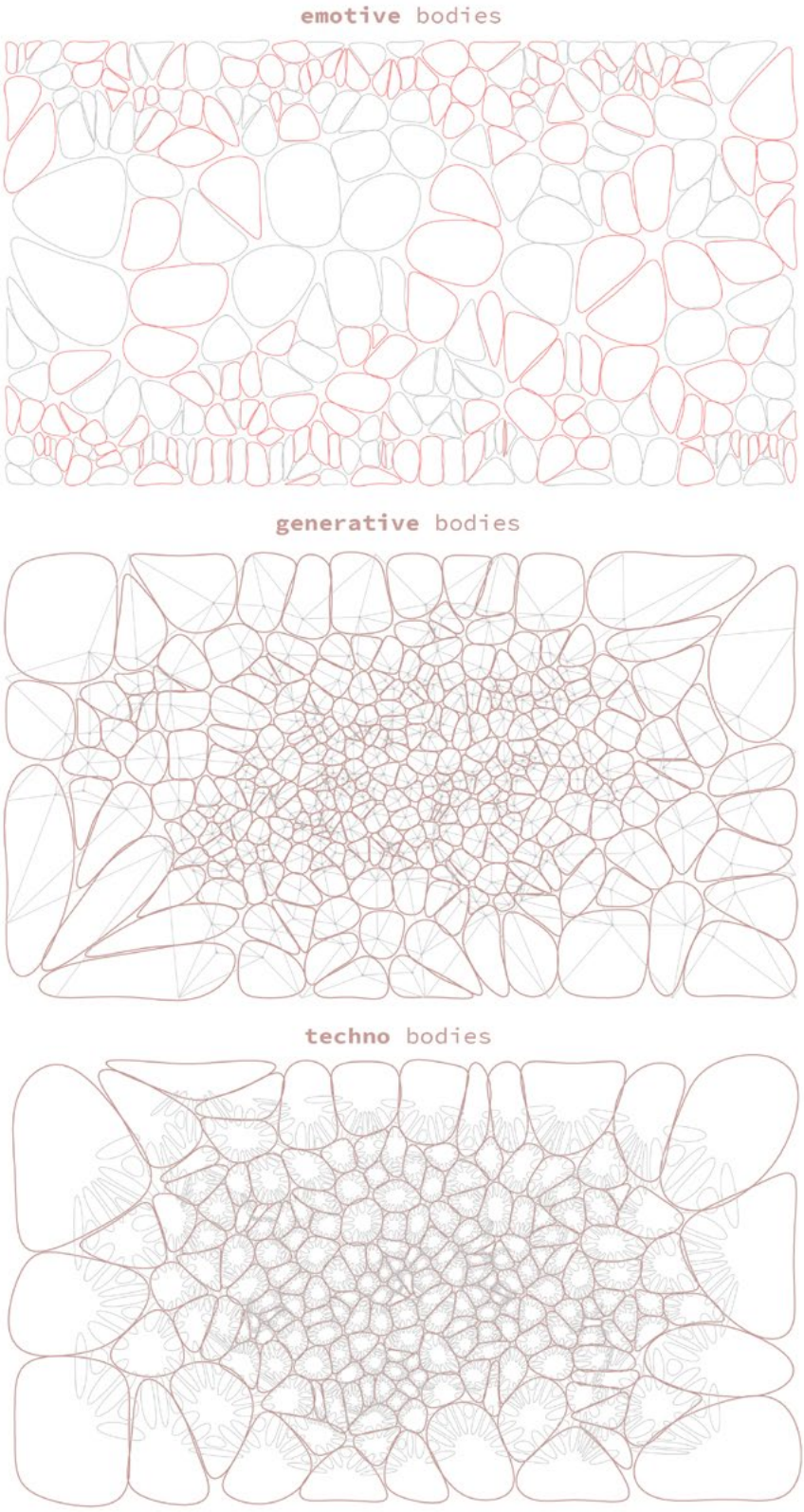

Fig 3. Example of a parametric animation cells study, related to the Techno Bodies Lecture / Anouk Wipprecht - illustration of the final graphic output and the algorithm script generating it

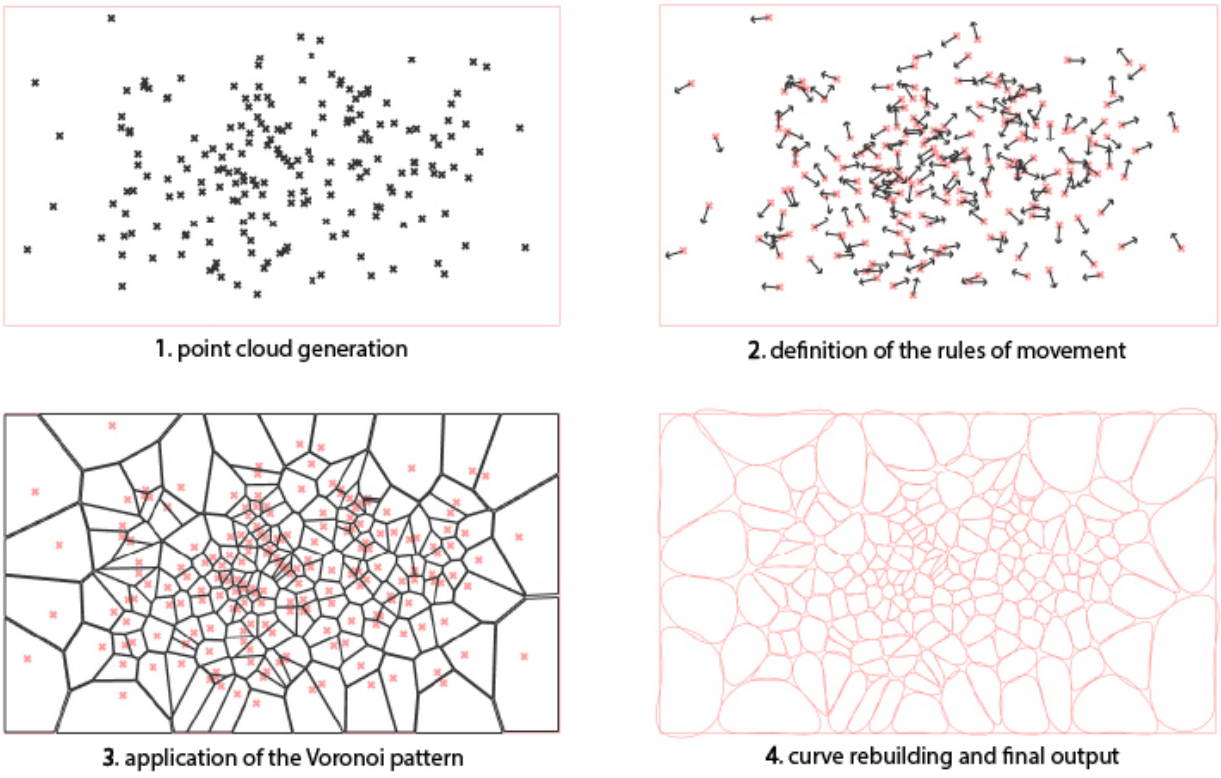

Fig 4. Illustration of the steps related to the creation of the *Techno Bodies* parametric animation

4. Conclusions

The essay's conclusions show the possibility of connecting parametric software's ability to show a more conceptual vision of the digital body.
Among the main objectives of this dialectical comparison were:
- the promotion of a heterogeneous body culture by using parametric tools;
- the integration of different digital technologies as visual tools for the fashion industry;
- the creation of new parametric processes offered by computing practices;
- the increase of awareness of the connection between the physical body and digital technologies

Thanks to the critical reworking of the seven lectures, the Postdigital Manufacturing Processes project has contributed to disseminating a design culture open to new perspectives and contemporary practices. Through the analysis and comparison between the different perspectives around the body, it was also possible to reflect and more deeply understand the possible future evolutions of the entire project.

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Linen Storylines in Procida.
From memory to con"temporary" project, between diffusion of knowledge and sharing of practices

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Abstract

This contribution is the incipit of a research that foresees, among its outcomes, the participation of the Department of Architecture and Industrial Design to the program of Procida Capital of Culture. The research group has set as objectives the research and the historical restitution of the handicraft manufactures of the D'Avalos Palace in Procida, destined to prison from 1830 up to 1988; the reinterpretation of the linen garments that come from the internal workings of the prison, according to a process of upcycling for the definition of a contemporary capsule collection; the graphic interpretation of the design process according to the logic of a manual capable to make the final user protagonist of the processes of reuse of the precious artifacts of the historical trousseau; the design of a line of textile furnishings, conceived and designed in such a way as to be able to generate business with the participation of the inmates of the Pozzuoli prison and, finally, the participation in an exhibition on the relations between Procida and the manufactures of weaving and embroidery.

Keywords

Cultural heritage, conscious fashion, upcycling, listening design, material culture and innovation.

1. Introduction

In recent years, the debate and the actions carried out regarding the sustainability of design and fashion – anticipated in watermark many decades ago by sensitive and autonomous protagonists as an alternative to the less virtuous commercial system – is being implemented more vigorously through actions and initiatives of various kinds, which enrich it with declinations that concern the entire life cycle of the fashion product, from its design to the practices related to disposal that follow its use and consumption (Fletcher, 2008; Seferian, 2021).

Among the most lively lines of investigation are those concerning the improvements that can be achieved, at different levels of the production chain, through innovation in procedures and technologies and the impact of sustainability on the social context. In this sense, attention is focusing on the capacity of sustainable practices to facilitate social and cultural change, starting from the assumption that sustainability does not only have to do with the material production of goods, but also with the cultural dimension of products, their symbolic production and their immaterial content. Many actions have made a concrete contribution to the diffusion of these modes that have shifted the focus from the logic of possession to that of sharing (Belk, 2010 and 2014; Rizzi, 2021).

Moreover, one line of studies has been dedicated to highlighting the role that institutions and producers can play in supporting the link between creativity and social inclusion, starting from the conviction that, in the field of material culture, supporting craftsmanship and manual work is equivalent to supporting equality. In this direction go the studies that address the role of creativity and craftsmanship in the textile-

clothing sector supporting the social inclusion of categories belonging to social marginality, such as the disabled, prisoners, etc. (Clark, 2008; Lunghi, 2012).
On the institutional side, within the European framework, the Faro Convention – adopted by the Council of Europe in 2005 and came into effect in the 2011 – suggests a cultural framework to be protected and to enhanced tangible and intangible heritage. The document starts from the premise that to ensure democracy and heritage sharing, resilience and sustainability requires a bottom-up, people-driven approach, in which communities can emerge to meet the shared challenge of managing common cultural assets.
This involves consolidation between citizens and civil society with governments and local authorities, in the protection and transmission of heritages for the benefit of future generations. In order to encourage citizens to recognize the importance of cultural heritage objects and sites through the values that these elements represent for all, it is assumed that in any action of protection and valorization, citizen participation has become an ethical obligation (Rinaldi, 2019).

2. From memory to con"temporary" project

In order to implement good practices inspired by the criteria of the Faro Convention and to make its approach to heritage its own, on the occasion of the nomination of Procida as Italian Capital of Culture 2022, DADI has entered into a program agreement with the City of Procida, aimed at collaboration in projects dedicated to the knowledge and enhancement of its manufactures.
Not forgetting that the cultural identity of a society can also be traced through its craft and artistic productions, the focus of the project was specified in the realization of a co-design process of the contents of an exhibition on linen and its manufacture, with the aim of disclosing its specificity and the production history of the island and, at the same time, to return a new narrative by interpreting the artifacts according to a contemporary language.
The subject of the investigation is connected to the presence, in the houses of the island and in the prison structure, of numerous looms.
The prisoners were obliged to carry out useful and productive tasks, besides those linked to the realization of goods necessary for self-consumption. Since the second half of the nineteenth century, in fact, in the penal home were active laboratories of weaving, the woolen mill with adjoining dyehouse, tailoring, shoemaking, carpentry and other small workshops. After the First World War, to the 94 manual looms were added more than 30 mechanical, allowing a significant increase in production: bundles of raw linen arrived from the sea, and they was dried and spun and then processed on the loom to make cloths, to be used for tablecloths and bed linen [Fig.1-2].
In spite of the production in a singular place, the cloths bought at the prison store had high quality characteristics and, together with those still produced in the domestic workshops, they passed into the hands of the Procidan ladies who worked them to make their wedding trousseau: the pride of each family embroidered with personalized decorations, handed down from hand to hand since ancient times, thanks to the nuns from Ivrea who instructed the local girls in the practice of embroidery (Retaggio, 2013).
This tradition continued until the 1970s, when the results of consumerism and industrial production halted this custom even on the island. But today many fragments of these treasures of Procidan textile history, like "relics", are still kept in the homes of local families, offering themselves to our eyes as tangible proof of the cultural and productive identity of this special place.
According to the assumptions mentioned in the opening, in the projects are involved – in addition to the University Department – the City of Procida, the Association Chiaiolella-Borgo Marinaro, which aggregates sensitive heirs of this heritage, the prison of Pozzuoli, where sewing and embroidery are practiced as re-educational activities of the inmates. The aim of the project, shared between the various actors involved, is to spread the knowledge of the island's craft heritage and material culture to the local community and to the widest segment of visitors and to conjugate the cultural interests through the practices of strategic design, for a reconversion of the use of historical artifacts, as indispensable link between past and present.
The role of the University was to set the conditions for activate a creative ecosystem through practices of co-design and according to the listening-design method for investing and transferring its intellectual capital within the mechanisms of local development, jointly generating processes of continuous innovation. From this cultural and productive position comes out the idea of elaborating, together with

Fig 1. Linen yarns processed inside the Terra Murata prison and trousseau elements made from procidan linen (Bonanno, 2021)

young creatives, the project of a collection that would reinterpret in a modern key the essential prerogatives of the local product, in response to the implicit innovation needs of ethical fashion.
The inclusive multidisciplinary approach, taken by the various actors involved, has meant that the theoretical-methodological plan led to the application and the contribution of historical-critical disciplines was integrated, in a single but complex research work, with those of design, even contemplating the technical and formal constraints expressed by the local partner.
The outcomes of the research and of the workshop with the students are a conscious fashion capsule-collection, named “LINUSITATO”, with the intent to communicate the high value of Procidan manufactures, through the integration of knowledge, know-how, creativity and innovation: a range of design reuse solutions of an artisan heritage, proper to the material culture of the island, that through a process of upcycling aim to "support the territory and Made in Italy" (Camera Nazionale della Moda Italiana, Manifesto della sostenibilità per la moda, 2012, point 6), and to promote the maximum use of resources already available, disincentivizing that of virgin materials.
The project, carried out under the banner of environmental sustainability and upcycling principles, aims to design different products to reuse vintage pieces of the trousseaus, found on the Procidan territory, and to value the precious experience of craftsmanship, within the contents of the archives of the island's houses, where were found artifacts, but also values, colors, formal details and compositional ideas.
The outcomes of the research project can be designated as a "conscious collection" born from the collaboration between teachers and researchers of the DADI and the FA.RE. fashion research lab – with the involvement of some students – with the team for the prototyping of the association of the Pozzuoli prison for the definition of a collection that goes beyond the contingency of Procida Capital of Culture 2022, to promote an ethical and social project. In fact, the main purpose of the collection is to spread the philosophy of "second chance" for women prisoners and for the "second life" of reused fabrics. A project of solidarity but also of freedom and respect for the environment based on the principles of regeneration of waste fabrics and awareness of reintegration into the world of work of marginalized people.
With this objective, and also with the aim of involving the final user of the products, the research will produce a catalog of possibilities for assembling and reusing the elements of historical trousseaus, in order to provide an instrument that satisfies the qualities of uniqueness, linked to the origin and preciousness of the materials, as well the possibility that a design and manufacturing process can be replicated through simple and synthetic instructions for self-design that participate in a dialectical process between tradition and innovation (Mari, 2002).

Fig 2. Linusitato, upcycling collection from elements of the procidan trousseau

3. Conclusion

In this way, re-contextualizing materials left out of the closets, or rather, making people appreciate the values and knowledge that generated them together with the technical aspects of island's garments created to satisfy practical and symbolic needs, means identifying a possible ideological tool that, by indicating a minimum intervention of renewal, modifies the possibilities of use and, above all, multiplies their qualities. In this sense, working directly with communities of indigenous craftswomen to develop authentic products, leads to bring back into their hands and their spaces the positive force that the needs of domestic life had fed at the origin of this story.

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New scenarios of conscious fashion system

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Abstract

In her 2015 Anti-Fashion Manifesto, international trend forecaster Li Edelkoort describes how fast fashion threatens the European textile industry and fashion culture itself, returning young people to the idea that fashion has no value. The fashion industry is at a breaking point and needs to change course. The ecological transition could be achieved by following a holistic approach, no longer only biologic but also regenerative: a slower production process that follows the rhythms of nature, and this is what is happening through regenerative agriculture, where crops are not forced and consequently workers also work at an appropriate pace, away from the risks of chemicals. This essay critically analyses the new frontiers of craftsmanship 4.0 and slow manufacturing in the Italian and global fashion system, analysing new project strategies towards a conscious rather than merely sustainable fashion concept, analysed in the FA.RE. fashion research lab of Officina Vanvitelli.

Keywords

Slow fashion, Slow manufacturing, Eco-transition, Metaverse, Craftsmanship 4.0

1. From Fast Fashion to Slow Fashion: ecological transition and digital fashion

"How can you think that a "thing" that is sown, harvested, sifted, spun, cut, sewn, printed, labelled, transported... can cost the same as a sandwich?". Li Edelkoort (2015)

In her 2015 *Anti-Fashion Manifesto*, the international trend forecaster Li Edelkoort describes how fast fashion threatens the European textile industry and fashion culture itself, returning to young people the idea that fashion has no value. The fashion industry is at a breaking point and needs to change course. The real breaking point with this unsustainable production model was the collapse of the Rana Plaza in Bangladesh in 2013, which directed fashion companies towards a more ethical path.
In 2007, the *Slow Fashion* movement was born with the intention of giving due value to labour, using quality materials and sustainable production processes.
The ecological transition could be achieved by following a holistic approach, no longer just organic but also *regenerative*: a slower production process that follows the rhythms of nature, and this is what is happening with *regenerative agriculture*, where crops are not forced and workers work at an appropriate pace, far from the risks of chemicals. This is a complete reversal of the industrial policies of recent decades, which have seen companies, driven by the need to have more product at a lower price and quickly, cause severe impoverishment of the soil.
Some brands have already started a *Farm-to-Closet* production system: *Zegna* grows textile fibers on its own land and the Californian company *Patagonia* produces *regenerative cotton* without the use of pesticides and GMO seeds. Patagonia has also taken steps to implement a special certification - the *Regenerative Organic Certification* - to verify compliance with requirements, methods and procedures that ensure certain standards are met. This is a certification that supports a holistic approach to agriculture that includes the welfare of grazing animals, fairness for farmers and farm workers as well as strict requirements to examine soil health and land management.

Fig 1. Overdoze of biocouture (Isabella Matrapasqua, 3D graphic project for the three-year thesis in Fashion Design, lab FA.RE. University of Campania “Luigi Vanvitelli”, rel. Prof. Roberto Liberti, 2021)

This type of production involves slow processes and a limited combination of different fibers and chemical components in order to limit environmental damage and promote sustainable waste disposal.
The virtual reality of the *Metaverse* could also be a viable alternative to reduce environmental impact. Many brands are grappling with digital fashion and new NFT (*Non Fungible Token*) technologies that offer the possibility to buy unique virtual collections or garments whose uniqueness is guaranteed by the *blockchain*. Unique works, these virtual clothes/projects are inextricably linked to a unique code that can be purchased and resold through cryptocurrencies on dedicated portals.
The textile sector, which has been accused of the high environmental impact of its production processes and overproduction, is now entering the metaverse, the world of digital reality.
The very problem of overproduction of textile waste could be contained thanks to digital fashion, which would allow the creation of entire digital collections and then produce only on demand, the pace of production and delivery would slow down making production more sophisticated and "well made" while consumers would have a much more intense shopping experience and be aware of the value of a garment thanks to the wait for delivery. This strategy could seriously lead to balancing supply and demand to the point of zero waste.
The development of these technologies could enable digital fashion shows and offer personal shopping experiences where customers virtually meet the designer to "wear" the latest collections without travelling, thereby reducing CO2 emissions.
Non-fungible tokens offer a solution to the problems of copyright and *greenwashing* thanks to blockchain technology that makes it possible tracing every step in the supply chain as well as protecting the data of NFTs which, once registered, cannot be altered.
To date, these digital technologies are energy-intensive, so the future of fashion in the Metaverse will depend not only on the presence of consumers in virtual reality but also on the evolution of blockchain

Fig 2. Overdoze of biocouture (Isabella Matrapasqua, images taken from the shooting of the three-year thesis in Fashion Design, lab FA.RE. University of Campania “Luigi Vanvitelli”, rel. Prof. Roberto Liberti, 2021)

sustainability. Although digital fashion does not create physical waste, it currently causes a large ecological impact.
The energy consumption required to release an NFT is currently very high, as is the consumption of 3D rendering technologies. Although many brands are implementing strategies to reduce their carbon footprint, to produce digital clothes they will need to implement additional sustainability measures to minimise their environmental impact.

2. Slow Manufacturing and Conscious Fashion

While on the one hand there is an intensification of the digitalisation process for the global fashion system, on the other hand there is a need to rethink a new awareness for the manufactures of excellence of our *made in Italy*. From 2017 onwards, Greenpeace presents the reports of the Milan fashion weeks with hundreds of examples of slow fashion for a more sustainable, responsible and circular fashion, with a list of already practiced and replicable solutions, from natural fibers to clothes repair, from fibers obtained from agricultural waste to clothes for rent. There are so many projects that fast fashion brands are conducting in this area, such as the *Save the Ocean* project by Yamamay, which in addition to raising awareness about ocean pollution, makes PET swimwear from 100% recycled materials, and many luxury and mass market brands are following this example. When talking about these aspects linked to environmental sustainability in the fashion product/process, it is necessary to do so in a wide-ranging way, with a focus on Corporate Social Responsibility and the ethical and environmental challenges of the fashion industry.
Slow fashion promotes a sustainable production model and is an opposite concept to fast fashion. It is

Fig 3. Overdoze of biocouture. (Isabella Matrapasqua, Experimenting with Kombucha, lab FA.RE. University of Campania “Luigi Vanvitelli”, Prof. Roberto Liberti, 2021)

part of the slow movement, which advocates production that respects people, the environment and animals. In contrast to industrial fashion practices, slow fashion involves local artisans and the use of eco-friendly materials, with the aim of preserving craftsmanship and the environment and ultimately providing value to both consumers and producers. Just as we have been talking about slow food for years now, since it was founded back in 1986 when Carlo Petrini founded the cultural gastronomic slow movement against the opening of a McDonald's in Piazza di Spagna in Rome, in defence of the small and innumerable producers and the excellence of Italian food and wine, today fashion designers as well as attentive chefs should promote the excellence of slow manufacturing throughout Italy. Attention to natural materials, to the extraordinary Italian workmanship, and the new technologies that can push new glocal brands with patents are the future of this challenge of the slow world against the fast world of international fashion.

What we report in our essay are some experiments carried out in the *Lab. FARE* of Vanvitelli University together with some graduates using natural materials such as *Kombucha* to create biomaterials from tea, and to develop real fashion collections that from 3D virtual mannequins made like real NFTs can

become experiments for new brands and university spin-offs.
Kombucha is an eco-sustainable technical fabric obtained from processes and raw materials that do not use energy or have an impact. The use of this material is still an experiment, but it certainly looks set to be one of the new frontiers of materials. Interesting is the aspect of colouring the fabric, in fact through a process of ferrous oxidation and using a colouring based on fruit and vegetables it is possible to create natural patterns; or using indigo allows to make the material anti-microbial. Here are some images of the OVERDOZE of *biocouture* project realised by Isabella Mantrapasqua for her three-year degree thesis in Fashion Design within the lab FA.RE. of the Vanvitelli University [fig.1, fig.2, fig.3].

3. Craftsmanship 4.0

“The next industrial revolution will be driven by a new generation of small businesses, straddling high technology and craftsmanship, capable of delivering innovative, highly customised products at a limited scale”. Chris Anderson

Digital craftsmanship is a cultural phenomenon that started at the beginning of the 2000s in the United States and then spread to Europe. The first digital craftsmanship projects in Italy were launched in 2011 and today they represent a possible renaissance for the manufacturing sector, which was at risk of extinction: a wind of change, research into new materials and new production methods is reinventing manual know-how, defining what we now call *craftsmanship 4.0*.
This new phenomenon is characterised by the integration of traditional manual techniques and new digital techniques, both in production processes and marketing strategies: from the most traditional craftsman who uses digital marketing to tell his story and his uniqueness to the bravest who invests in innovative production processes.
Today there are virtual services that allow communication with the customer during the production phases, technologies such as 3D printing that reduce prototyping times and *body scanners* that eliminate the distances involved in bespoke commissions.
The space in which the digital craftsman or *digital maker* operates is the *FabLab*, or *Fabrication Laboratory*. One of the founders of the first FabLab, Professor Neil Gershenfeld, says that considering technology as a process opposed to the world of making, and therefore of art and customisation, is reductive because today's technology requires a high degree of customisation to meet the needs of extremely various products. A distinctive feature of FabLabs is *sharing*, the creation of a digital community of people with different skills who work together to optimise socially useful work. The result is unique products, the product of a skillful combination of traditional and innovative processes. [fig.3].
This new integrated approach between tradition and innovation involves not only the introduction of new production techniques but also the possibility for artisans to *re-skill* and update themselves in order to take on roles which are no longer simple and mechanical but completely sophisticated, both in engineering and in more traditional sectors such as tailoring.
An interesting story is that of Simone Segalin, a *digital shoemaker* from the Veneto region in Italy. Using a *laser scanner*, he instantly obtains the measures of the customer's foot, which he then takes into a 3D printed model that will serve as the last for making a made-to-measure shoe. The advantage of this method lies above all in the fact that it eliminates distances, so that even an American customer, thanks to the foot scanner, can receive an Italian product, personalised and of high quality.
It is no coincidence, therefore, that this phenomenon is referred to as the *Digital Renaissance*, precisely because of the profound social, cultural, artistic and economic change that characterised the 16th century. Today, man is developing a new vision of himself and the environment, rediscovering the value of almost forgotten arts and crafts thanks to technological innovation.

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Designing a Conscious Fashion Experiences: strategies for Generation Z

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Abstract

The way in which the current fashion industry is perceived by the different generations is changing. In this endeavour, younger consumers are considered throughout the literature as central figures capable of piloting significant change towards sustainability. Therefore, the mixed-method study directs attention to Gen Z as a sensible, transformative actor in the fashion system, capable of effectively merging the need for ever-new clothes with sustainable practices. After a preliminary phase where a case study analysis and personas profiling is conducted, the research goal was to examine user fashion practices and behaviour through a survey that involved Gen Z consumers. The results indicate consumers' desire to own fewer, high-quality clothes. However, there is little empirical evidence to support demands for sustainability in their purchases. Therefore, if encouraged, this audience could become a driver for the sustainable future of fashion.

Keywords

Z Generation, fashion sustainability, trend, design for behavior change

1. The unsustainable cost of a generational paradox

Today, we are facing a moment of great demographic complexity. Five generations of consumers coexist globally, from the silent generation (born before 1945) to Generation Z (born after 1995). They all have specific characteristics and expectations concerning the current fashion industry and how it operates. In this already heterogeneous scenario, due to the coronavirus pandemic, the ongoing debate within the fashion industry on sustainability, circularity, environmental impact, and responsible consumption has accelerated further. More than ever, consumers are in many ways more aware of their fashion consumption and eager to adopt new approaches and develop new habits.
Since 2019, numerous researches (Vogue Business, 2021) have delved into the rise of those consumers defined as "woke" as one of the ten trends that the fashion industry should observe and explore. In one of the most relevant, the State of Fashion report, which boasts the collaboration of Business of Fashion and McKinsey, states that compared to the Millennial, Generation Z has a more pronounced green focus that is reflected in both purely environmental and social issues by embracing campaigns such as #metoo or #blacklivesmatter. As well as being aware of the issues, the attitude of these generations is intentionally activist, with around two-thirds of consumers worldwide saying they would change, avoid or boycott brands based on their stance on controversial issues, attributing responsibility for some global problems to brands. Nevertheless, the purchasing dynamics behind these reports' numbers boast that the passion of the youngest is not entirely convincing. That raises suspicions that sustainability is emerging as a trend among the new generation but not as a genuine habit. This is demonstrated by the high percentage of purchases resulting from the peak of microtrends and reaffirmed by a report on information sources influencing Gen Z purchases. Data from the Buzzoole survey on the Italian landscape, in fact, prove that social media and video content predominantly influence the purchases of

Gen Z. Among the most popular contents are "Lookbook" or "Haul": short videos presenting large quantities of clothes that effectively normalising compulsive buying.
In light of this controversy, the research cultivates a sensitive and empathic approach to the way we design for Gen Z consumers. Furthermore, through different methods, this contribution aims to verify whether sustainability strategies are adaptive and flexible to their behaviours and define some guidelines for designing products and services, hoping that users push to a paradigm shift.

2. A mixed-method to face Gen Z

The purpose of the present study was to examinate Gen Z behaviours and attitude facing sustainability challenge into fashion practice. The study applied a mixed-methods approach by combining qualitative and quantitative inquiry (Creswell, 2009). By integrating multiple research methods, it was possible to simultaneously handle a more exploratory research phase with more punctual, confirmatory phases. The entire research process was structured through three phases. The first and the second phases, which involved case study analysis and personas profiling, were helpful for hypothesis generation. The third one, allowed us to verify the hypotheses and obtain valuable results to develop project guidelines. Moreover, the case studies was analyzed through a Best-Worst Scaling analysis to verify their adaptability to the user needs. After that, the results obtained from these two approaches were complementary, allowing a better understanding of the specific needs and the definition of more consistent guidelines verified by the user.

2.1 Phase One: Case Study Analysis

In order to understand what strategies are currently in place to face the rise of micro-trends among younger generations, several case studies were identified and categorized. Overall, the cases was focused on fighting obsolescence, both psychological and technical. The definition of the categories derive from the most relevant literature about fashion sustainability [tab I]. In each case study, strengths emerged that could be leveraged to design for Gen Z and weaknesses, which verify flexibility and adaptability to the users under consideration.
The analysis shows that one winning strategy could be to create a relationship with their clothing. Another aspect that needs to be resolved is that of 'social acceptance' among the younger generations. Finally, the dynamics of swapping, vintage and second-hand purchases are the most recent ones that are worth investigating as sustainable behaviour is Gen Z. Strategies concerning restoring and repairing might be less effective as they require a special care and attention to the garments that this user does not tend to have.

2.2 Phase Two: Personas Profiling

The next step was the definition of personas, a useful tool to establish who are the users to be addressed. A profiling card was created for each user-type identified, which differs from the others in the way they approach the purchase of clothing. This tool is useful to understand the needs and requirements of each user regarding their characteristics, in order to identify the ideal sample for the questionnaire and outline the possible questions to be administered.

2.3 Phase Three: Survey

After outlining the personas, the survey questions are drafted. The survey is one of the methods used to collect data. The questions are designed to investigate the shopping habits, use and consumption of clothing in Gen Z. In order to facilitate the compiling, was develop an interactive survey using a creative platform, making it easier and more pleasant to fill in.
The survey was divided into three main sections: the first part investigates the partecipants' anagraphical data to be sure of the test audience, the second part analyse the habits (incl. purchase, use and consumption and disposal). Finally, the third part examine the case studies strategies. The survey, was tested by several users from the different age groups before being submitted to the final sample, in order to revise and highlight critical points.

Tab I. Sustainable fashion strategies resulting from the literature review

Strategies Analyzed	Service based fashion system	Multifunctional, trasformable garments	Design for slowness and longevity	Design for repairing	User involvement in design and/or manufacture
Description	This categories include services for renting or organizing wardrobe.	This categories focus on clothes adaptability over the age and fashion trend.	This categories includes swapping or evaluation strategies for second hand clothes.	This categories is focused on reparability of clothes.	This categories is analyze consumer participation in design process for sustainability (eg. DIY production).
Sources	Fletcher, 2008 Fletcher & Grose, 2012	Fletcher, 2008 Fletcher & Grose, 2012 Cao et. al, 2014	Fletcher, 2008 Fletcher & Grose, 2012 Cooper et.al 2013	Fletcher, 2008 Fletcher & Grose, 2012	Black, 2012 Fletcher, 2008 Fletcher & Grose, 2012

Fig 1. Have you ever bought clothes from a sustainable brand, with certifications? (Illustration: Authors)

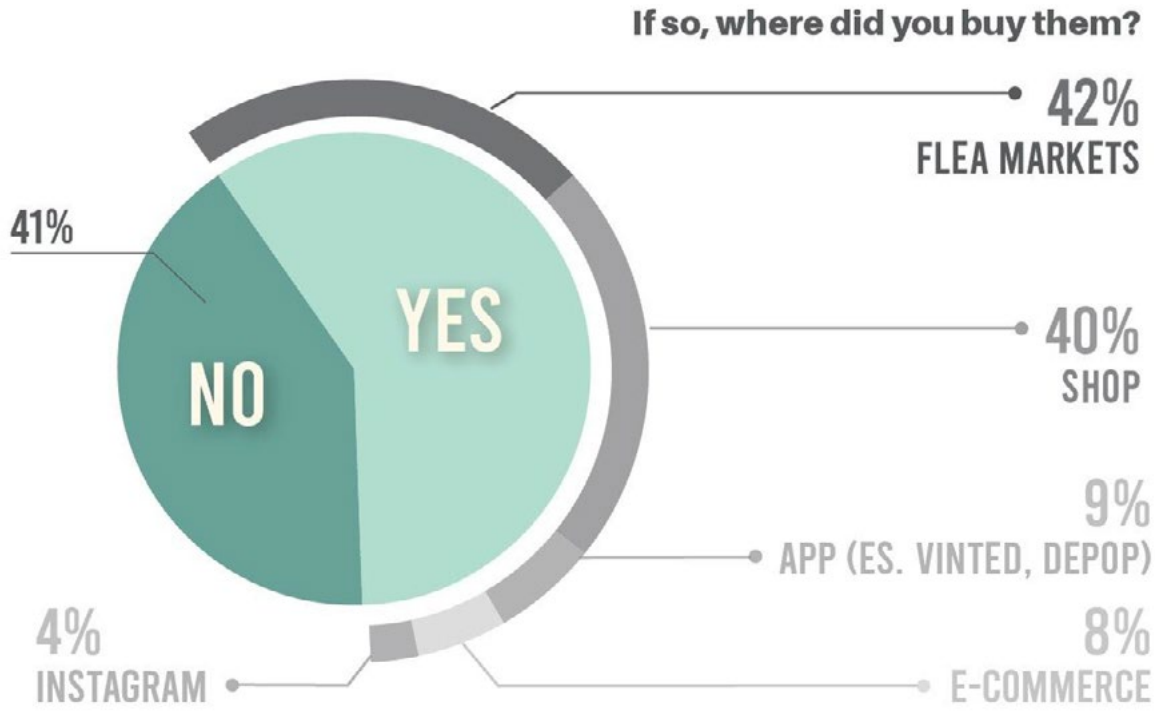

Fig. 2 Have you ever bought second hand/vintage clothes? (Illustration: Authors)

3. Results

The data analysis through 245 answers reflects the generation contradiction: respondents are sensitive to environmental issues (70% are aware of the fashion industry's impact), but they continue to buy large quantities of clothes despite this. Furthermore, knowledge about these issues is superficial: 49% of respondents are not aware of the meaning of the term Fast Fashion.

The aspect most checked by users when shopping is the composition of the clothes, while fewer people verify the place of production. Nevertheless, unexpectedly, they inquire about the durability and longevity of a garment, although they do not consider what to do with it when they no longer want to wear it. Furthermore, 64% of consumers say they have never bought from sustainable brands. However, when asking respondents to indicate which brands they bought from, 44% indicated that fast fashion brands are sustainable (Figure 1).

For those who stated that they have never purchased from sustainable brands, one of the reasons is why is difficult to get in touch with these brands even though there is a willingness to do so. Consumers are uncertain about terms, certifications and parameters and this probably discourages them from making more informed choices.

A reassuring finding is that vintage and second-hand products are becoming increasingly popular: Gen Z is breaking down the stereotypes associated with this sector, with 59% of respondents claiming to have already purchased second-hand products (Figure 2).

The emotional attachment generated for their clothes is significant: 85% responded that paying less for their clothes did not reduce their affection. Moreover, 91% of respondents indicated that they continue to wear clothes that have gone out of fashion because they particularly like them. The results also show a willingness to adapt a garment to new needs when it goes out of fashion (Figure 3). Among the users who say they "give away" the clothes they no longer want, 57% donate them to humanitarian associations.

Fig. 3 When you realize that your dress is out of fashion, what do you do? (Illustration: Authors)

who say they "give away" the clothes they no longer want, 57% donate them to humanitarian associations.
On the other hand, the analysis of the case study strategies shows that users would like to be able to wear the same clothes often without feeling uncomfortable, and that they would prefer to have a wardrobe of a few, well-selected, high-quality pieces rather than many low-quality items.

4. Conclusion and Guidelines

In conclusion, based on the evidence that has emerged, guidelines have been defined and describe the essential elements for an innovative and conscious fashion experience needed by Gen Z to combat the system's unsustainability. Trend cycles must not be denied, but balanced: designers must make the process of sustainable consumption an outlined path, intuitive and easy to follow, characterised by different phases, each of which involves specific actions, first and foremost asking questions. In order for these ways to be adopted, spread and become a shared habit, the process of buying and consuming must become an experience, a social activity through which the user can take care of the planet and the causes that matter most to him. Therefore, it could be helpful to encourage interaction between brand

and consumer to create a lasting bond, a mutual exchange of information. A process of responsible consumption, characterised by in-depth research, must aim to show the sustainable realities that exist and offer affordable prices. It is necessary to create a virtuous network to reach out to users and inform them about existing sustainable realities, given Gen Z's difficulty in getting in touch with them. Finally, if the aim is to ensure that consumers use their product longevity, it is essential to create an emotional bond. If the garment has a substantial emotional value, the user will not replace it for new ones. Therefore, the survey evidence that it is possible to make trends and sustainability coexist, exploiting the sensitivity of the users under consideration to develop socially accepted consumption habits. In the future, it is expected that a choice of carefully selected items will probably replace impulse purchases and that users, especially among the younger generations, will return to buying classic pieces of impeccable quality, proving themselves capable of intelligent and long-lasting investments.

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Futurable fashion state of mind. Sustainable projects and theories for new fashion system scenarios

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Abstract

The aim of this contribution is to discuss projects and theories in order to understand the impact of the fashion system on the environment. To do so, the main idea is to briefly analyze some best practices focusing on their ethical approach. We want to demonstrate that a change of paradigms is a process that could activate a chain reaction and help the fashion system to be more sustainable ecologically and beyond.

Keywords

fashion imaginaries, futurable scenarios, sustainable consciousness, radical actions

1. Introduction

The contribution is focused on radical projects and theories that have a positive impact – or could suggests one – on the fashion system as we know it. In discussing best practices and main idea the aim is to highlight some aspects about the relation between the fashion system and the environment. Also, the analysis could be useful in order to push forward our way, as designers and researchers, of imagining a fashion system more and more healthy in the environmental and social fields.

2. The concept of protection: who and how?

In June 2020, a few months after the beginning of what the Italian writer Gianluigi Ricuperati identified as the *Coronacene* era, it was published on Flash Art website a fantascientic story called *Olympia. Un breve racconto di fantascienza*. It is signed by Ippolito Pestellini Laparelli and Erica Petrillo members of 2050+, an interdisciplinary agency that works across different fields: design, technology, environment and politics. The story took place in a future world where humanity had already faced five pandemic crisis along with an energetic one. These critical events had transformed the planet Earth in a less welcoming environment. To leave her home, Olympia has to dress properly:

> "caviglie e polsi coperti, guanti fino all'avambraccio, occhiali anti-inquinamento e mascherina, ovviamente. Olympia ama la moda, queste passeggiate occasionali sono un'opportunità per sfoggiare i pezzi più preziosi del suo guardaroba. Oggi sfoggia un paio di stivaletti alla moda con suole rivestite da spore di micelio. Quando Olympia cammina, il sudore dei suoi piedi viene filtrato e combinato con le spore del micelio, alimentando così una coltura fungina. Il suo stesso corpo viene utilizzato come fonte di produzione di un cuscinetto morbido e caldo, che tornerebbe molto utile nell'eventualità di una tempesta di neve – di questi tempi, i fenomeni meteorologici estremi sono all'ordine del giorno" (Pestellini Laparelli & Petrillo, 2020).

In *dressing* so, Olympia contributes to restoring the health of planet earth even if she will not live to see the results of her efforts. In the story the garments have two main functions that are strictly related one to the other. The first function is to constantly protect the body from the environment and the second function is to participate to restore the health of the environment.

What Olympia's story highlights is the necessity to take care – as we do with our body – of what surrounds us. And Olympia does it through her clothes. The story gives today *another* possibility to think about our contemporaneity. It is undeniable that climate change is not something that will happen in the future but it is something that is happening in our present time. Therefore, the urge to protect our body from natural (but not so natural) disasters is an issue of our time. What is crucial is the need to find solutions that, in order to protect today, don't damage tomorrow.
The masks that we wear everyday for protection against Covid-19 infection, if not dismantled properly will be a heavy environmental topic very soon. The mask is a wearable-fashion item, which was included in the exhibition *ITEMS: is fashion modern?*, curated by Paola Antonelli and held at Moma in 2017-18, New York. Therefore, they are presented here as an example to what we should pay attention to in our daily dismantling-clothing routine. This example is something that questions our actions and makes us wonder: what if there were masks that protect us while we are using them and when disposed they feed the ground?
The need to protect the body from a dangerous context through garments is a concept that has been studied, developed and investigated in different ways and always in relationship with social, cultural and political context. In fact, the practice of dress and fashion is "always and everywhere situated within a society and a culture" (Parkins 2002, p. 2).
For example, the body protection has been investigated in *The Life Fair. New Body Products*, an exhibition held at The New Institute, Rotterdam in 2016. The exhibition, curated by Giovanni Innella and Agata Jaworska, was organized in nine sections. In the *Security* section there were displayed products – most of all wearable items such as the Bulletproof Clothing, the Protecting Clothing, the Distracting t-shirt or the Protest Suit – projected to keep your body safe from critical situations.
Also the book *The Supermodern Wardrobe* written by Andrew Bolton and published by V&A Publications faced the topic of body protection through the analysis of fashion design projects. The Supermodern clothing "is designed to respond to the physical and psychological demands of transitional spaces such as roads, railways, airports and the street" (Bolton, 2002, p. 7). The clothings are perceived as shelter "against inclemencies of the weather as well as against noise and pollution from traffic; affords physical protection against both the gaze of passers-by and the neutered gaze of surveillance camera" (Bolton, 2002, p. 7).
The wearable items included both in the exhibition and the book are *situated* in a cultural background where the human body is accessories in order to have a better performance in a specific situation. The items also answered the necessity of protection but doesn't count – at least not always – the impact on the environment. Their functions are focused on the interaction between the body and the context determined mainly by both political and embodied issues and less by the health of the environment.

3. Actions and needs of today

Today, urge the need to look at the impact that every action makes on the surroundings, including the way we dress. The environmental crisis is more and more an issue that influences economics, social realities and politics. The concern is tangible and it is highlighted through paradigmatic actions and theoretical assumptions and even through cli-fi novels and stories such as the one mentioned above. Actions in this direction are some of the following.
The *Ellen Macarthur Foundation* works endlessly to promote a circular economy, also in the fashion field. The foundation works with global brands including luxury brands, independent labels, high-street giants, pioneers of the virtual fashion experience, and clothing resale and rental specialists. It has published reports on how to aim for a new textiles economy (2017), jeans redesign (2021) and new business models for the fashion industry (2021). In 2021, the foundation also published *Circular Design for Fashion*, a book that "offers a creative lens through which to discover and develop new products and navigate radical transformation, while addressing many of the world's most pressing challenges" (Ellen Macarthur Foundation, n.d.).
The fashion activism movement *Fashion Revolution* born as a response to the Rana Plaza disaster that took place in 2013 in Bangladesh. They claim to "campaign for a clean, safe, fair, transparent and accountable fashion industry. [They] do this through research, education, collaboration, mobilisation and advocacy". They clearly expose the idea that the critical issues about the fashion industry fall on the whole system. This is why the aim of their actions is to transform the entire structure of the system. The movement works for a fashion industry that «can lift millions of people out of poverty and provide them

with decent and dignified livelihoods. It can conserve and restore our living planet» (Fashion Revolution, n. d.).
It is crucial to underline that a healthy environment also means a healthy society. Be sustainable ecologically and socially it means also that you turn on a decolonialize flow on different levels. Also through fashion enterprises. It is proved by the *Ethical Fashion Initiative* founded in 2009. The *EFI* works at the intersection of international development, the creative industries and the fashion and lifestyle sector, offering sustainability services, products, and development projects. The *EFI* fights against poverty and ensures sustainable development along with other social targets. In doing so, it creates and strengthens social enterprises in emerging economies to connect discerning international brands in fashion, interiors, and fine foods with talented local designers, artisans, and micro-producers. The *EFI* is an example of no more exploitation in land and social resources in the global south. But through projects you give knowledge to the native populations.
These actions activate a chain reaction that drags into the debate of economic and political issues and led the fashion designer and activist Vivienne Westwood to state that “what is good for the environment is good for the economy” (No men’s Land, n.d.).
The results are an engagement on different fronts, including the political one.
In fact, the *Climate Change Conference* (COP26), helded in Glasgow last year, finally made space also for issues related to the fashion system unlike the one before. On this occasion there were discussed strategies and presented projects such as Stella McCartney's *Future of Fashion* focused on material innovation such as “mycelium leather, grown from mushroom roots; vegan alternatives to animal leather; plant-based fibers like forest-friendly viscose and regenerative cotton; and regenerated materials crafted from waste” (Stella McCartney, 2021).
All these projects here briefly presented can be linked to Daniëlle Bruggeman's theory. Her book, *Dissolving the Ego of Fashion*, focuses “on the importance of envisioning a future of fashion in which we engage in a more human way with material objects that surround our bodies and subjectivities” (Bruggeman, 2018, p. 9). In her book she engages a critical discourse about the Ego of fashion and the need to dissolve it. Going through a dismantling of Fashion overstructure we can seek and affirm alternatives and more ethical scenarios.

4. Conclusions

Following Bruggeman theory we can conclude that the consciousness is built through knowledge, experimentation and even imagination. As designers and researchers we have the responsibility to seek for alternatives with sensibility. Imagining and pushing towards projects that embody new values, according to the changing structure of economic systems, we will be able to grow the good part of fashion and not its ego. We have to gain knowledge about our responsibility towards our future and make our daily decisions matter; because also wearing a specific item has always been a political action.

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Responsible Italian Fashion.
An open brand for sustainability in fashion

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Abstract

The fashion industry is today, more than ever, under siege because of its alarming environmental impact; the conversion towards sustainability is extremely necessary and in order to do so, it is imperative to intercept which are the measures to analyze, evaluate and re-design the fashion system with an approach that is in balance with the values of sustainability.
Starting from the analysis and evaluation of the strategies already present in the literature and implemented in the panorama of sustainable fashion, the paper illustrates the project of a brand for the certification of Italian sustainable fashion called RIF/Responsible Italian Fashion. A brand that in addition to being structured on quantitative parameters is also a model of inspiration for companies based on cultural and qualitative sources from the culture of the project. The data and cultural products presented in the paper, such as the Sustainable Fashion Trend vademecum - which serves as a guide and accompaniment to obtaining the label, illustrate the results (to date achieved) of the Research Grant: Strategic Communication for the innovation and enhancement of the Fashion System, conducted at the University of Campania "Luigi Vanvitelli".

Keywords

Fashion conscious, Sustainable project culture, Brand Awareness, Sustainable Certifications

1. An overview of sustainable actions in fashion.

In its origin, fashion is in *perpetuum mobile*; (...) the phenomenon of fashion is intimately and inseparably linked to two "eternal" and "universal" attributes of the human way of being-in-the-world (...) at any point in human history and in any region inhabited by humans, fashion plays an active and crucial role in making constant change the norm (Bauman, 2012). An aspect of positive self-regeneration that Bauman links to a deeply human characteristic. But when the current variety of the fashion phenomenon is determined by the colonization and exploitation of that eternal aspect of the human condition by consumer markets (Bauman, 2012) it happens that fashion becomes the second most polluting industry in the world.
It happens that the *perpetuum mobile* of fashion turns into 300,000 tons of discarded clothes every year that end up in landfills or are destined for incineration (E. M. Foundation, 2017). And this is just one of the alarming data that since the last few years fill the reports of the analysis on the environmental impact generated by fashion that can be contained through a series of actions and strategies often promulgated also by governments with the aim of reducing the pressure on global warming and not only. In fact, in addition to the launch of the Green in italy brand, promoted by the Ministry of Ecological Transition in 2015, (https://www.mite.gov.it/pagina/made-green-italy) for the protection and enhancement of green policies related to sustainability in Made in Italy, research shows that beyond the national territory there are many governmental entities engaged in drafting international agreements aimed at rebalancing the fashion supply chain, through pacts, alliances and new legislations that aim to guide and control the

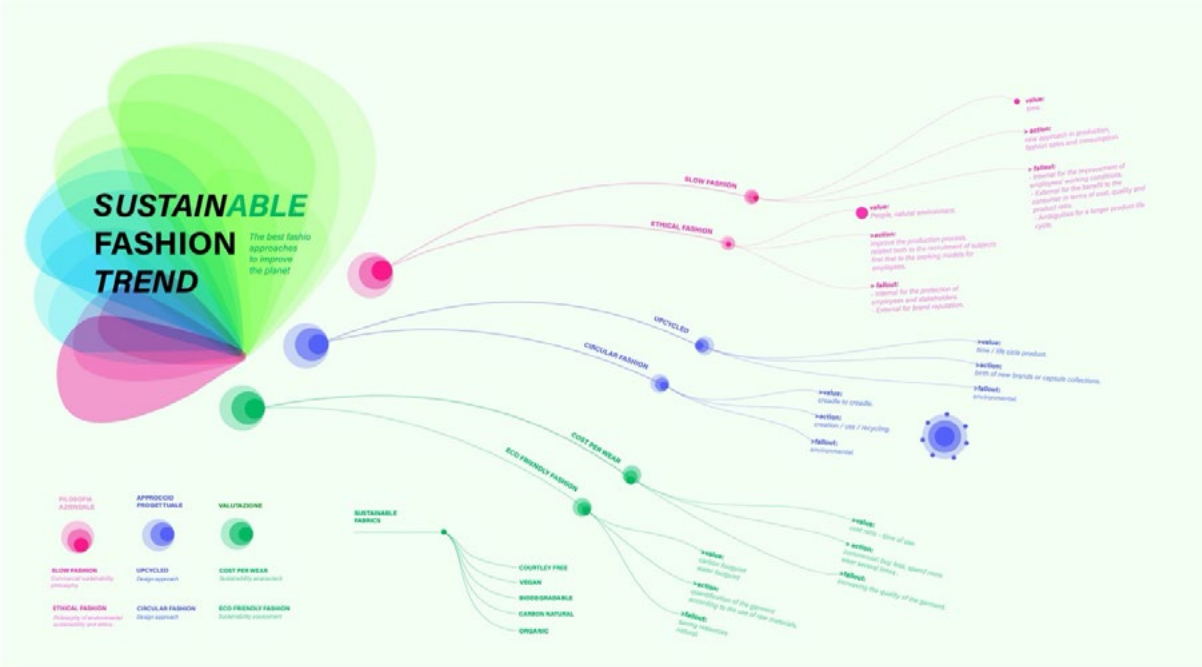

Fig 1. Sustainable fashion trend: vademecum with the main sustainable strategies in the fashion world

production of fashion industries. First among them is the Bangladesh accord, born in 2013 (after the collapse of Rana Plaza) and signed by over 200 companies producing in the Asian republic.
Since 2015 with the adoption of the Sustainable Development Goals (SDGs) by the UN; the subsequent definition of the 2030 Agenda for Sustainable Development; the Green New Deal; the New Urban Agenda; the New European Bauhaus; multiple guidelines are presented to address environmental issues from which the fashion industry draws fundamental inspiration (Pastran, Colli, Nor, 2021).
The Fashion Pat is a valid example with which the French government establishes sustainability objectives to be reached in the short term, indicating precise dates as the maximum limit for the reduction of environmental impact in the fashion sector. From the Manifesto of Sustainability, drawn up by the National Chamber of Italian Fashion, to the one defined by the Fashion Revolution association, a main objective emerges: to ensure fair and respectful behavior throughout the entire sapply chain with zero-impact actions and production. This means efficiency in the use of resources but also the ability to enhance quality: in other words doing "better with less" (Frey, M., 2012, p. 3). But despite the political actions and the rich literature on the subject, in fact, as stated by K. Fletcher, there is still a real difficulty and slowness with which sustainability becomes a consistent practice, and a working method within the fashion system itself (2018). In light, therefore, of the multiple actions already designated by scholars and designers and still poorly applied in the re-founding of the fashion system, and furthermore, in the accentuated condition of disorientation in which many companies find themselves having to re-emerge, the need to raise the awareness of the fashion industries to the issues of sustainability through widely used communication tools capable of enhancing the best practices and the main sustainable models already present in the literature is emphasized.
Therefore, an infographic is proposed that illustrates the main sustainable trends in fashion [Fig.1] through a mapping capable of collecting in a single container the possibilities that companies have to convert to sustainability. A communicative tool imagined as a vademecum of sustainability in fashion capable of guiding companies to become skilled in the generation of profits and in the realization of products according to the standards of the Global Reporting Initiative (GRI). The trends proposed in the infographic are divided into three main levels represented by methods that act on the corporate philosophy, the design method and the qualitative assessment of sustainability.
The vademecum is an informative support that serves as an accompaniment to companies that intend

Fig 2. Certification values

to acquire the RIF/Responsible Italian Fashion certification illustrated in the next paragraph. The map, through the skills of visual design, aims to overcome what Bruno Lator defines as a problem of language that has generated the misunderstanding of climate change - in a geographical, geological, social and political sense (Antonelli, 2019).

2. A brand to certify the fashion Made in Italy responsibility

Made in Italy, consisting of the fashion, agro-food, automotive and furniture industries, in order to be certified according to the canons of sustainability, requires targeted and specific programs, capable of going into the details of each individual production area. Sustainability is guiding us to understand that the time has come to make normative divisions between the sectors of Made in Italy, which, although belonging to the sector of cultural and creative industries, are profoundly different from each other, not so much in their creative approach, but certainly in the technical development of their products. Through the analysis of the certifications already in force and of the strategic actions reorganized in the vademecum illustrated above, and assuming that: the norms, the materials and the processes of the sectors belonging to the Made in Italy supply chain are very different from each other, we propose a certification brand dedicated to sustainable Italian fashion called RIF / Responsible Italian Fashion. Certification, expressed through the issue of a brand, bases its identity on the set of several values and actions necessary for the sustainable transformation of the fashion supply chain. Its image is defined by the mode of production, that is, by the process of increasing complexity that makes it an "object of meaning" (...); the identity is linked to the idea of the path (Floch, 1995) that companies undertake to start the conversion towards sustainability.
Adhering to the inclusive logic and connection between stakeholders and supply chain promulgated by Robert Edward Freeman, for whom sustainability is the result of the consideration of the interests of all the actors involved in the conception, production, supply and sale of a product (Freeman et al, 2019), the certification identifies 10 parameters [Fig.2] through which to obtain the RIF / Responsible Italian Fashion [Fig. 3]. The identified areas, with equal level of value, were defined starting from the awareness that obtaining an immediate and radical conversion towards sustainability is not possible for companies whose business is rooted on industrial models born in other historical moments. But they can certainly start a progressive process of sustainable conversion through an incremental certification that can grow and enrich over time in relation to the sustainable actions taken by the company.
Specifically, the 10 parameters are divided into two categories, the first focusing on the intangible values of fashion production, while the second is oriented towards more material actions and linked to the culture of sustainable design. Together, the 10 parameters serve to assess the sustainable approaches that companies can implement to convert their business models towards designing more conscious fashion.
The first five parameters address from different points of view the issue of sustainability involving in

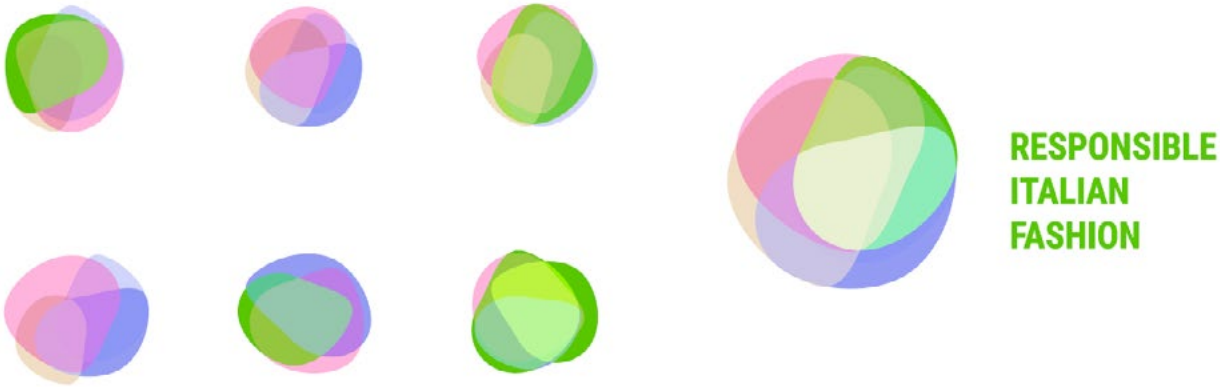

Fig 3. On the left Complete brand, on the right examples of different conformations of the same brand developed in relation to the progressive acquisition of the sustainability objectives achieved

particular the social and environmental, they are distinguished in:
- **People**: the first parameter aims to focus attention on the value of the people who work in the fashion supply chain, assessing the times and places where they carry out their activities and listening to the needs of the individual in order to plan work models that are alternative to classic forms of dependence.
- **Animals**: the second parameter is aimed at respecting animals and has as its basic principle the observation of the rules regarding the use of skins and furs, up to and including the abolition of certain products from the supply chain.
- **Nature**: the third looks at nature, evaluating both the methods used for energy supply and the choice of raw materials used in the collections.
- **Water**: the fourth is completely linked to water, to the control of spills on the one hand and to the choice of companies to use materials produced with a minimum use of water resources.
- **Air**: the last in the category linked to intangible values is air, identified with the aim of monitoring the quantity and quality of emissions released into the atmosphere.

The other 5 parameters are related to the use of certain design approaches that can lower the impact of the fashion industry and are:
- **Slow Fashion**: that is, production that respects the working time of man and nature. In this area are not excluded actions that thanks to technology speed up processes leaving free time to man, as long as they are able to restore value to the product that had made the wealth of Italian fashion with its beauty, its care for the material and details - that because of the increasingly short time of fashion has ended up in the background (Chiuni, Spadafora, 2020).
- **Ever Green**: the ever-greens, i.e. projects characterized by a very strong component of innovation and/or design culture such as to set themselves above trends, living forever.
- **Over Season**: the garments that go beyond the seasons, which thanks to the design of intelligent collections are able to adapt to climate change.
- **Zero Waste**: zero waste collections, products with a strong focus on waste and therefore designed not to have any type of fabric waste in the production phase.
- **Upcycled**: the upcycled lines, coming from the process of converting waste materials or useless products into new materials or products of better quality and with a lower environmental impact (Rinaldi, Testa, 2013). Therefore, collections born from the systemization of a program of recovery of used items for the re-proposition of regenerated garments capable of readjusting, and even surpassing, the times of fashion.

These parameters are not written to remain always the same but to be updated and enriched, adapting to the changes of a more conscious fashion industry that tends to change not only in relation to new trends but also with respect to industrial and legislative rearrangements imposed by "our pinewood".
The certification first represents a declaration of intent and the beginning of a willingness to change; It is an evolution of the fashion industry's mindset, documenting the existence of ideas, values, ethical concepts, creativity, and human dialogue behind new products (Winterhalter, 2019).

The RIF brand is granted not as a "physical sticker" to be affixed to one's labeling but as a digital instance that changes based on the sustainable growth of the company receiving it.
The design of the brand image was developed with Fischel's (2002) vision in mind, who deems "irrelevant" corporate identities that refuse to address change. The durability of the visual design implies "resistance" and is a debatable aspect when it comes to designing the identity of a constantly evolving entity (Moubarak, El Asmar, 2018). The concept of permanence and durability while in the design for the sustainable product are fundamental, they lose their meaning in the project related to visual communication which inversely becomes "sustainable in its mobility". The brand, therefore, has a mobile identity and visual image that changes, increasing its appearance in relation to the goals that companies achieve over time. An open sign that is enriched over time, so that the same certification will have multiple expressive and visual forms created according to the sustainable profile of each company.

3. Conclusion

The objective of certification is to go beyond the desire to certify sustainable actions to become a model to which companies decide to adhere. The purpose of the research and development of the certification is also to amplify the meaning of Made in Italy by associating the concepts of innovation, digital, community, sustainability to the classic values that characterize it, often only linked to geographical origin. From this point of view, the "Made in Italy" linked to fashion becomes the spokesperson for sustainable design and cultural values on which to base its future.

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Collaborative sustainable innovation improving inclusiveness and value adding capabilities

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Abstract

In response to the challenges posed by sustainable development, and in line with the 2030 agenda which promotes the multi-stakeholder approach as one which can help to achieve the Sustainable Development Goals (SDGs), the project seeks to promote inclusive and sustainable development of the textile industry and increase the cotton sector's contribution to the Egyptian economy, employment and manufacturing value added and export growth. This will be done by actively engaging the private sector (CSR, investors, partners, mentors, etc.), developing business partnerships, and leveraging non-traditional funding. Moreover, as the proposed project puts the promotion of sustainable and inclusive growth at the centre of its action, particular emphasis is placed on addressing economic and social inclusiveness and active involvement of vulnerable groups (poor, women, youth, rural communities). The project will help to improve the farming environment (non-toxic and biodiverse), develop sector-specific technical and entrepreneurial opportunities, and capture business opportunities in national and international markets, thus contributing to better and more secure livelihoods for target beneficiaries and their households. Final consumers, in national and international markets, will also benefit indirectly from the proposed project as a result of efforts to preserve the quality and sustainability of Egyptian cotton and strengthen its competitiveness. Important innovation resulting from the collaborative partnership of Egypt and Italy will create new scenarios and concept design.

Keywords

Sustainable development; sustainable agriculture; education; active involvement; cotton textile

1. Introduction

Cotton is the world's oldest commercial crop and one of the most important fibre crops in the global textile industry. It is grown in more than 100 countries on 2.5% of the world's arable land – some 35 million hectares – making it one of the most significant crops in terms of land use after food grains and soybeans. Cotton is also a heavily traded agricultural commodity with over 150 countries involved in exporting or importing it.

Cotton plays a major role in the economic and social development of developing and newly industrialized countries. There are millions of people worldwide who derive their livelihood from cotton's value chain, which involves several stages: research and development, cultivation, extraction of fibres, primary processing of the fibre for marketing, secondary processing of the fibre to yarn, dyeing and other processing to convert the yarn to fabric, and manufacturing clothes and other items. Furthermore, millions of people are employed in the associated activities of trade and transportation. As many as 100 million rural households – 90% of them living in developing countries – are directly engaged in cotton production. An estimated 350 million people work globally in the cotton sector when family labour, farm labour and workers in connected services such as transportation, ginning, baling and storage are taken into account. The global garment and textile industries alone employ 60 million to 75 million people worldwide.

The cotton and textile industries play a significant role in the Egyptian economy. Egyptian cotton has historically represented the gold standard for the world's finest linens and clothing. Egypt's extra-long staple cotton (Gossypium barbadense), often called "White Gold", is grown in the moist atmosphere near the Nile. Egyptian cotton is among the finest and most lustrous varieties and the highest quality fibre. This quality is due to several factors. First, Egyptian cotton is generally handpicked in order to avoid mixing the yield of mature and immature plants. Secondly, it has exceptional length and brightness. The longer the fibre, the better the textile quality as it means less breakage and more uninterrupted thread. Therefore, the Egyptian cotton is widely used by luxury and upmarket brands.
Egypt's textile industry has historically been considered of paramount importance to the country and its economy. Currently, the Egyptian textile industry contributes to 3% of the country's GDP, accounts for one third of the manufacturing value added, employs almost one third of Egypt's industrial workforce, and constitutes 15% of Egypt's non-oil and gas exports (worth 2.6 billion USD).
Nonetheless, as recently stated in "Vision 2025 Expansion & Employment – Egypt textile National strategy", Egypt still plays a marginal role in the global textile value chain as its textile industry is highly fragmented and its textile products do not meet the needs and requirements of the international market. Despite the efforts made by the Egyptian Government in recent years, the situation with regard to both the competitiveness of the Egyptian lint cotton and readymade garments remains critical. The industry suffers from lack of renovation, high input prices, limited skilled labour, and limited innovative and sustainable agricultural practices.
Spinning and weaving are the main sectors of the textiles industry. Most of the spinning and weaving firms are owned by medium- to large-scale public-sector companies, although the private sector is slowly entering this sector. Dyeing and finishing are the weakest points in the value chain, with the least amount of investments. The public-sector dominance of spinning and weaving has limited producers' responsiveness to consumer preferences and burdened the sector with over employment, inferior technology, operational inefficiencies, and low levels of capital utilization. Moreover, linkages between spinners and ready-made garment producers are weak at best.
As a result, some yarns and finished fabrics are imported from India, Turkey, Turkmenistan, Bangladesh, Pakistan, and other countries to supply the ready-made garment industry. Some finished fabrics are made of Egyptian cotton, processed abroad, and re-exported to Egypt.
Egypt exports long staple (LS) and extra-long staple (ELS) cotton, as well as garments (52.8% of exports) mostly using imported yarns, and finished fabrics and home textiles (25.4% of exports) made from local yarns/ fabrics. 75% of raw cotton exports are sent to low cost, textile countries (e.g. India, Pakistan, China) where raw cotton is processed into added-value yarns, fabrics, garments (e.g.100% Egyptian cotton shirts are made in India). Egypt imports relatively cheaper medium staple types for the textile and clothing industry.
The public-owned companies have been unable to compete with imported materials and products, losing market shares. As a result, many firms have declined, shutting off several production lines.
Egypt, that had initially seen an increase in area and production from the 1940s to the 1970s, has experienced a gradual production drop since the 1980s as well as a gradual decrease in consumption as customers shifted to cheaper, lower-quality fibre and fabrics like polyester. A substantial decline occurred in domestic sales and exports alike. As a consequence, and in light of the difficulties of marketing domestic cotton crops, thousands of Egyptian farmers have turned away from cotton in favour of other crops for both domestic markets and export. With the steady increase in imports (clothing, dyes and supporting material for the industry) compared to exports, the result was an overall negative trade balance. The textile and clothing industry began to drain foreign exchange resources rather than being a source of income.

2. Cotton Production in Egypt

The decline in production is strongly related to the decrease in foreign demand. The decline in exports of lint cotton is due to the perceived degradation in quality, both in terms of seed impurity and cotton lint contamination. Both cleanliness and contamination are determined by harvesting methods, handling, storage, transport and ginning practices. Contamination of lint by non-vegetable substances is one of the major problems, especially with handpicked cotton. Moreover, contaminated cotton causes disruptions in the spinning process; hence, such cotton is normally sold at a considerable discount to

compensate the spinning company for the additional costs incurred.
Organic cotton accounts for a very small percentage of the overall cotton production in Egypt, despite the competitive advantage offered by the country's highly favourable natural environment and the potential benefits and profitability of penetrating the growing niche market of sustainable agriculture. The global demand for organic cotton has been steadily growing in the last years as an increasing number of brands have made commitments to use 100% organic cotton by ambitious target dates, often 2020. In order to benefit from this international trend, Egypt would need to establish a more sustainable and integrated supply chain starting with raw materials and fibre production, in addition to actively promoting and sustaining new and innovative business models by fostering collaboration between big and small brands, local producers and national and international mills.
In an effort to restore international market confidence in the quality of Egyptian cotton, the Government of Egypt has recently undertaken relevant normative reforms, namely: i) the Ministerial decree number 1918/2015, which identifies the conditions for qualifying seeds for planting and reintroduced the Government full ownership of seed production and distribution, and the establishment of a monitoring system covering the entire supply chain of licensed Egyptian cotton holders under the umbrella of the Cotton Egypt Association (CEA). In addition, the Government, through the Cotton Research Institute, has planted selected cotton seeds from high quality lint in an area of 12,600 ha in eight governorates which produced 41,237 bales of cotton. The Ministry of Agriculture and Land Reclamation (MALR) declared its intention to conduct another round of seed purification to improve the quality and expects that around 60% of the seeds produced are going to be used for the 2019/20 crop. Despite the forecasted total increase, production of ELS is expected to continue its downward trend.

3. Cotton industrial transformation in Egypt

While Egyptian cotton is famous worldwide for its long staple, which allows it to be spun and woven into luxurious fabrics, getting full value from the long staple cotton requires updated and sophisticated technologies. However, most of Egypt's textile factories are equipped with outdated machinery not suitable for the processing of Egyptian ELS cotton. Indeed, the consumption projection for the year 2019/20 estimates a consumption of lint cotton equal to 590,000 bales and local spinners are expected to obtain 70% of their cotton requirements from imports and the remaining from local cotton production.
Coupled with the above-mentioned challenges is the lack of skilled human resources. In spite of the ongoing efforts of the Government of Egypt and the international community, notably through the EU TVET initiatives (I and II), to revamp and update the Technical and Vocational Education and Training System, there is still a substantial mismatch between the education system's outputs and the labour market requirements. According to the Annual Global Competitiveness Report 2015-2016 released by the World Economic Forum, Egypt ranks 131 out of 140 nations for the overall quality of its education system (with similar rankings for math/science and management education), and 117 for innovation.
This persistent dearth of skilled workers and general managers is particularly evident in the industrial and agricultural sectors. There is, in fact, a clear lack of horizontal integration between the agricultural and the industrial training path, resulting in a misperception of the complex interaction of the different actors of the cotton value chain, as well as a tendency to the segmentation of knowledge and limited coordination between education institutions and market operators.
Building on the continuous support received by UNIDO on promoting industrial development and on recent achievements related to employability, value chains and private sector development, the Ministry of Trade and Industry requested that UNIDO extend the collaboration to support the textile value chain.
Given the above scenario and in line with its mandate of promoting industrial development for poverty reduction, inclusive globalization and environmental sustainability, UNIDO is proposing the implementation of the project "From cotton seeds to clothing: Enhancing the sustainability, inclusiveness and value addition of the cotton value chain in Egypt", the objective of which is to improve the economic, social and environmental performance of cotton growers and processors while strengthening support institutions.
The proposed project has been designed to build upon the ongoing CSR initiative "Cottonforlife", implemented by FILMAR S.p.A. in collaboration with Alexbank, to further integrate the scope of intervention and scale up the impact of the Cottonforlife Initiative in order to upgrade the whole value chain, reach out to a larger number of producers and exporters, and expand the capacities of the

chain, reach out to a larger number of producers and exporters, and expand the capacities of the institutions involved.
Cottonforlife is an integrated five-year program aimed at promoting sustainable fashion through transparent, eco-friendly and socially responsible Egyptian cotton textile production. The Initiative has managed, through signed agreements between the private sector and farmers' associations, Ministry of Agriculture and Ministry of Education, to initiate plantations of organic ELS Egyptian cotton (Giza 45 and Giza 87). It has produced a unique and extra-fine organic yarn, called NILO, which has been presented at the most important international fairs and has received acclaim from international buyers and most of the renowned Italian brands. The Initiative has also invested in the development of human resources, through an earmarked co-funding by Alexbank which has committed to supporting the initiative for five years, by assisting agricultural and industrial textile schools to improve the horizontal integration of the agricultural and the industrial training sectors. Activities implemented ranged from curricula development to training of trainers and publication of updated textbooks for the three – year course school paths.

4. Main Target Groups

The project seeks to propose and pilot innovative and sustainable solutions to address the various gaps and shortfalls along the whole LS and ELS cotton value chain. The project's activities will involve the following target groups, extending to at least 1,000 direct beneficiaries:
- Cotton growers and cotton growers' associations, that will benefit from knowledge sharing and capacity building with regards to the adoption of sustainable agricultural practices for organic and non-contaminated cotton and better market linkages;
- Private sector textile enterprises including SMEs and youth-led start-ups (involved in spinning, weaving, knitting, dyeing and/or finishing, garment manufacturers), whose productive and export capacity, social and environmental performance will be enhanced;
- Traders and retailers, who will benefit from improved practices in terms of product certification and traceability mechanisms as well as from better coordination and exchange of information between national and international actors;
- Agricultural workers as well as technicians and professionals employed in textile enterprises, whose skills will be enhanced to meet labour market needs, through updated educational and training programs and on-the-job training;
- Students enrolled in secondary technical agricultural and industrial schools and/or attending vocational training programs, whose skills will be enhanced to meet labour market needs, through updated educational and training programs and on-the-job training;
- Technical support institutions and specialized centres, which will benefit from the exchange of expertise and capacity-building activities.

Moreover, since the promotion of sustainable and inclusive growth is central to the project, particular emphasis is placed on ensuring economic and social inclusiveness and the active involvement of vulnerable groups (poor, women, youth, rural communities). It is anticipated that the project will improve the farming environment (non-toxic and biodiverse), develop sector-specific technical and entrepreneurial opportunities, and capture business opportunities in national and international markets, thereby contributing to better and more secure livelihoods for target beneficiaries and their households. Final consumers, in national and international markets, will also benefit indirectly from the proposed project as a result of efforts to preserve the quality and sustainability of Egyptian cotton and strengthen its competitiveness.

5. Comparative Advantage

The project benefits from and capitalizes on UNIDO's technical competence and experience in improving agro-industrial value chains in Egypt, as well as in modernizing the cotton-textile-garment (CTG) value chains – from the processing of raw materials to the production of textiles and ready-made apparel and improving market access, quality and certification infrastructures – in South Asia, Latin America, West and Central Africa (jointly with WTO) and the South Mediterranean region. Additionally, UNIDO's best practices in sustainable consumption and production (through RECP measures) in the

South Mediterranean region and the promotion of renewable energy for industrial applications in Egypt will be leveraged.
In response to the challenges posed by sustainable development and in line with the 2030 agenda which promotes the multi-stakeholder approach as one which can significantly help to achieve the Sustainable Development Goals (SDGs), the project seeks to promote the inclusive and sustainable development of the textile industry and enhance the cotton's contribution to the Egyptian economy, employment and manufacturing value added and export growth by actively engaging the private sector (CSR, investors, partners, mentors, etc.), develop business partnerships, and leverage non-traditional funding.
In order to boost cotton production and its conversion into yarn, and to expand the cotton-based textile industry in Egypt, the project integrates two complementary strands of action: i) improve the economic performance, inclusiveness and sustainability of cotton growers (particularly of LS and ELS cotton); and 2) improve the economic performance, inclusiveness and sustainability of private sector textile enterprises (processors of LS and ELS cotton, including SMEs and youth-led start-ups).
The proposed strategies are in line with UNIDO's approach to agri-value chain development, in as much as this development has a positive impact on employment, including in rural areas (off farm processing and income diversification), offers market access to smallholders, and creates business linkages to small and medium enterprises (SMEs). A value chain describes the entire range of activities undertaken to bring a product from the initial input-supply stage, through various phases of processing, to its final market destination, and includes its disposal after use. Accordingly, segments of the value chain to be targeted are prioritized based on their proven potential for local value addition (local content and processing), profitability, inclusiveness and sustainability.
As part of its efforts to build national capacities along the whole cotton value chain, the project intends to strengthen the capacities of the existing support institutions to set up a regulatory environment conducive to eco-friendly and socially responsible cotton production and industrial processing.
By developing and implementing the above strategies in close coordination with existing government and non-government support institutions, UNDIDO intends to:

- Benefit, directly and indirectly, at least 1,000 individuals depending on the cotton value chain
- Improve access to employment / entrepreneurial opportunities in the cotton value chain
- Support the increase of the productivity and competitiveness of cotton growers, ginneries and textile enterprises
- Promote the increase of export revenue
- Encourage investment in the cotton processing industries
- Promote the increase of cotton value added
- Promote more efficient use of resources in both cotton production and processing.

6. Cotton Sustainable Production

Based on lessons learned from similar ongoing initiatives implemented by Filmar in Egypt, and on international agricultural best practices, the project will raise the awareness of LS and ELS cotton growers by deploying pilot programs to demonstrate suitable options for improving cotton cultivation with regards to organic plantations, low contamination, and more efficient use of water, fertilizers and pesticides, and preservation of soil health. Technical sessions and on-the-job training will be complemented with study tours in order to increase growers' technical knowledge and their capacity to adopt sustainable agricultural practices, as well as their understanding of the market and buyers' requirements through direct contacts with the immediate consumers of their cotton, i.e. spinning mills.
Organic cotton, using natural rather than chemical inputs, pesticides and fertilisers, is environmentally sound, regenerates soil fertility, avoids contamination of land and water, and is healthier for farmers and rural communities themselves as it is based on organic inputs and fertilisers that are less likely to poison or contaminate users.
Unsustainable agricultural practices that rely heavily on agrochemicals will be discouraged. Cotton farmers rely heavily on agrochemicals such as herbicides to eradicate weeds, and on pesticides to control the numerous pests which, according to estimations, destroy around 15 percent of the world's cotton. The consequences of the uncontrolled use of agrochemicals include the deterioration of soil

quality and productivity, contamination of groundwater, increasing resistance of pests, negative effects on biodiversity, and health risks for farmers.
Hence, it is essential that farmers be made fully aware of the consequences of not having adequate protective equipment and of utilizing hazardous chemicals. An integrated pest management approach and the use of pest control techniques other than pesticide application will be promoted in order to reduce reliance on pesticides.
The project will also encourage the adoption of efficient water management practices that help to optimize water use, maximise productivity, and minimise cotton's environmental impact. Moreover, better soil management practices, whereby nutrients are applied on the basis of the crop and soil needs, will be promoted as this improves and maintains the structure and fertility of the soil and minimizes erosion.
Furthermore, value addition activities, including processing and marketing of cotton seed by-products, are identified and promoted, thus contributing to increasing the income of cotton growers, thereby improving their livelihoods.
An increasing number of individual consumers as well as large companies, especially in niche markets, have become interested in certified organic cotton, in improving the quality of their supplies in line with international requirements, and in maintaining the social standards within the value chain. For all this, they are prepared to pay premium prices. Quality is, therefore, a prerequisite for trade and market access.
Any problems that arise during any stage of production or processing can cause irreversible damage to fibre quality and reduce the producer's profits as well as the those in other sectors of the textile industry including spinning, weaving, dyeing, and finishing. The efficiency of the gin is affected by the level of debris and contamination of the seed cotton. Therefore, the quality and value of yarn that can be spun is directly related to the quality of the lint cotton delivered to the spinning mill.
Practices for harvesting, managing and storing seed cotton so as to minimize debris, contamination and damage will be promoted. The knowledge and skills of target cotton growers will be upgraded with regards to quality standards, quality control and quality assurance systems, and laboratory testing procedures. This is essential in order for cotton production to better match buyers' quality requirements and international standards.
Ginners, classifiers, breeders and traders will be trained on the development, preservation, characterization of the quality and classification of the cotton fibre.
An integral part of the efforts to improve quality will be directed to strengthen the capacities of the MALR and its affiliated institutions to ensure that production conforms to quality requirements and international standards. An action plan and technical guidelines for the improvement of the quality of Egyptian organic cotton (standards for quality, growing, ginning and classification of cotton, and good trade practices for cotton) will be developed and disseminated.
Increasingly, buyers and consumers are demanding transparency and traceability. The project builds on the best traceability practices implemented by Filmar for the production of Nilo. Filmar is one of the certified companies in the framework of the Italian Traceability & Fashion scheme, managed by Unionfiliere and promoted by Unioncamere and Italy's Chambers of Commerce. It creates a voluntary certification scheme providing transparent information to consumers about: the locations of the main production stages in the production chain; the health values supporting the product; the product's 'environmental friendliness'; and the manufacturer's social responsibility.
Moreover, the cotton growing sector in Egypt suffers from a shortage of research on the breeding of new cotton varieties and increasing the yield per feddan. In addition to improving quality control and assurance, the capacities of the MALR and its affiliated institutions with regards to cotton-related agricultural monitoring is enhanced with a view to improving existing cotton varieties and developing new ones (via organic cultivation and low contamination, seed purification, development of new hybrids) based on market demand and related certification. Furthermore, the private sector will be encouraged to become involved in the experimental cotton plantation, in order to help reduce cotton stocks and meet the cotton trends and requirements of national and international markets.
In order to prevent the further deterioration of the quality of Egyptian cotton and to advance Egypt's position in the international market, improvements must be made to seed quality, cotton productivity, cotton quality and cleanness prior to raw fibre sales, and transparency and traceability. Cotton growers and relevant institutions must be proactive in the promotion and branding of non-contaminated and

and relevant institutions must be proactive in the promotion and branding of non-contaminated and organic cotton in selected destination markets.
Finally, based on sustainable agricultural practices already being applied, the project, in close cooperation with the private sector, will develop / update training programs (including in-company practical training, internships, exchanges) targeting TVET students and trainers to ensure that such programs are aligned with labour market requirements.

7. Conclusion

The importance of moving up the value chain is illustrated by the percentage of the value added at each step of the CTG value chain, which increases with the level of processing. In line with the government priority of increasing the presence of private entrepreneurship in the textile industry, and unburdening the sector from the public spinners and weavers and their outdated technology and inefficient production, this project aims to identify and promote local value addition in terms of local content and processing, as well as related investment opportunities for downstream processing to ensure that Egyptian cotton yarn is processed domestically instead of being exported as lint cotton. In turn, this will also provide new and better employment and income opportunities to the local communities and hence better and more secure livelihoods.
This will be achieved through the provision of technical and business support services to LS and ELS cotton processors in order to improve their technical, technology, managerial and marketing capacities (supply chain management, production management, technology management, responsiveness to consumers' preferences nationally and internationally), as well as matching with investors and funding opportunities.
In addition to a sound analysis of the value chain, in order to compete better, all actors in the value chain need a better understanding of destination markets and consumers. Therefore, opportunities for the promotion of the LS and ELS Egyptian cotton in national, regional and international markets are identified through the established network of Filmar and its business linkages with high-end buyers in niche markets as well as through other networks of private sector companies. In addition, market familiarization missions to cotton-consuming countries will be organized to learn what their clients expect from them and to promote their products.
Given that quality, as previously mentioned, is a prerequisite for trade and market access, cotton processors' awareness and skills about the quality of processed cotton goods, process control techniques in spinning, weaving, dyeing and finishing, and the testing of processed cotton goods, will be improved.
Moreover, building on UNIDO's activities in Egypt and elsewhere aiming at promoting sustainable consumption and production patterns, the project also raises awareness of and gives support to target enterprises in the adoption of RECP measures for rationalizing the use and improving the re-use of water, energy, chemicals and other resources, starting with metering resource consumption, which will result in less adverse environmental impacts and will help the enterprises make savings on resources.
Special attention will be given to industrial wastewater treatment, as the textile industry, and specifically dyeing, consumes great volumes of water, and to the promotion of productive uses of textile waste through, for instance, innovative upcycling models.
The absence of skilled labour and national technical expertise constitutes another obstacle to the competitiveness of the Egyptian textile industry. The Egyptian textile industry needs to be supported by an efficient and updated education and training system, given that physical capital in the absence of human capital provided by efficient education and training is of less value. Therefore, one of the aims of this project is to provide the textile sector with skilled young entrepreneurs and managers as well as the necessary trained technical labour with a comprehensive set of competences and skills ranging from cotton cultivation to the production of yarns and fabrics as demanded by the industry. Filmar's and Alexbank's ongoing initiative to update training programs in industrial schools will be leveraged, and parallel efforts will be made to establish industry support services by upgrading technical and entrepreneurial skills for local advisory services to serve the textile industry and promote new and creative fashion design solutions (including but not limited to product design and marketing, garment modelling, innovative upcycling of textile waste, and export promotion).
The project will not only provide technical and business support services to individual enterprises, but

will also support networks / clusters. In order for enterprises, especially SMEs, to be able to overcome sector-level constraints and increase their competitiveness, inter-firm cooperation within clusters is another important enabler of development and innovation. Clustering allows a concentration of resources and funding in targeted areas with high growth and development potential that can spread beyond the target locations (spill-over and multiplier effects). Clustering gives enterprises access to specialized suppliers and support services, experienced and skilled labour, and the knowledge sharing that occurs when people meet and talk about business. Clusters are particularly promising environments for SME development. Due to their small size, SMEs individually are often unable to realize economies of scale. Within clusters, SMEs can achieve shared gains through the organization of joint actions between cluster enterprises (e.g., joint bulk inputs purchase or joint advertising, or shared use of equipment) and between enterprises and their support institutions (e.g., provision of technical assistance by business associations or investments in infrastructure by the public sector).

Specifically, the project will facilitate joint market access and promotional activities, business partnerships with exporters and retailers, synergies with technical support institutions, fashion centres and academia to reinforce production, technological innovation, creativity and export capacities.

Building on UNIDO's accumulated expertise in developing and upgrading industrial zones and parks, the project will also identify, in close collaboration with national public and private stakeholders, the need for textile industrial zones / parks and develop related technical and financial feasibility studies.

In addition to upgrading and developing supply and production capacities, the project, in close collaboration with the MTI and its affiliated institutions, will promote the development of sectoral strategies and policies, which are necessary to improve the competitiveness of the cotton and textile industry. Special attention will be given to the identification of public-private partnership models not only in spinning and weaving, but also in the printing and dyeing sectors because of the large investment cost involved.

The awareness and technical and operational capacities of MTI and its affiliated institutions will be strengthened with regards to the services provided to the textile industry by the project to ensure competitive and sustainable cotton processing (technological innovation, quality control and assurance, RECP, innovative product design and marketing, and export promotion) and its conformity to market requirements and international standards.

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BAL 22

ROUNDTABLE

Aguinaldo dos Santos*

The roundtable carried out during *BEYOND ALL LIMITS 2022* set the challenge of discussing the "The Future of Sustainable Fashion". To accomplish that it adopted an innovative approach: instead of the conventional approach of selecting acclaimed professors, it brought together young scholars, all of them Ph.D. candidates. It also adopted a non-conventional approach to select the roundtable participants: a special open call invited young scholar to send a video (less than 5 minutes long) presenting their perspective on the theme, connecting as much as possible their arguments with the results of their research. A Panel of experts assessed and selected the participants based on the quality of content of these videos.

The roundtable occurred on the 12th May, from 14:30 to 16:30 (CET), and it was be carried out in English. It began with a general question for the participants: *What is your point of view on the future of sustainable fashion?* Each one had a five-minute presentation for a reply. The discussions began with the question *Could you share some examples from your country?* where each participant could provide examples and further evidence of the relevance of his/her proposition for the future of fashion. Subsequently the roundtable involved a cross-questioning phase where each participant presents a question or reflection to another roundtable participant. On the last part a set of elected questions/provocations from the conference attendees was presented to the roundtable participants.

The depth and breadth of the discussion contributed to a high quality roundtable. **Anikó Gál** (Hungary) debated the value system that underlines consumption and production within the fashion sector and its implication towards sustainability; **Emma Gambardella** (Italy) dealt with the issue of reduction of environmental impact in fashion via sustainable materials (e.g.: atoxic, recyclable, renewable); **Janice Accioly Ramos Rodrigues** (Brazil) brought into the discussion a set of interrelated topics such as slow fashion, upcycling, co-creation and transparency and the impact of emerging technologies; **Valentina Alfieri** and **Silvestro Di Sarno** (Italy) focused their discussion on the implications of migrating from a fast to a slow fashion, with their video presentation dealing with the potential of digital technologies (NFT, metaverse, virtual reality, etc) for the future of a more sustainable fashion. We are thank you for this young scholars for the quality of the discussions that certainly will inspire the design community on its search for a more sustainable future in the fashion industry.

*Coordinator of the roundtable
Head of NDS / Paraná Federal University

Positive impact of fashion: value system beyond consumption and improving design processes

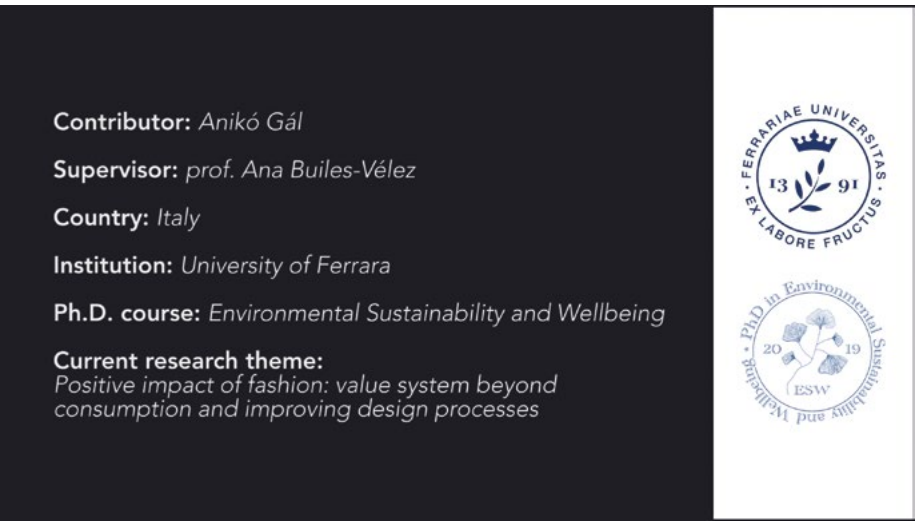
Anikò Gàl
Università degli Studi di Ferrara_Italy

My mission as a designer and a researcher is to work for a positive impact of fashion; as a collective action, it can be a vehicle for large scale change in short time. In my video, I talk about the value system of fashion that strictly connects to my current research project.
Fashion doesn't exist without consumption and most of the elements of fashion and its production have changed significantly in the last century. Talking about *fast fashion*, novelty and change are at the core of the production and consumption. But what other meanings can fashion have today for people? My point is that taking a step back and understanding what is our relationship to fashion today contributes to delineate a paradigm shift in the culture of fashion. Different inputs are needed in the fashion design process to follow this paradigm shift and achieve a positive impact of fashion instead of the highly quoted negative impact.

Digital development relates to all levels of the fashion system, from supply chain transparency and digital design to informative labelling. In my view, technology is a tool that contributes to systems built by human beings and based on their inputs. Thus, digital development itself does not enable systemic change. The process begins at the input which is shaped by mindset and culture. This is the reason why I find essential to focus on the process of cultural paradigm shift.
The topic of education emerged as well. I find that integrating sustainability into academic programs is fundamental in order to avoid considering it an optional design criteria.
Finally, my point about the next steps towards sustainability is to interrupt immediately harmful processes and habits: waiting for a detailed sustainable system model to be elaborated is not realistic and out of schedule. Alternative solutions will come along for each challenge through creativity and collaboration.

Frame 1. Anikò Gàl from Università degli Studi di Ferrara, Italy

Frame 2. Donella Meadows on leverage points



Frame 3. Affiliation and research argument

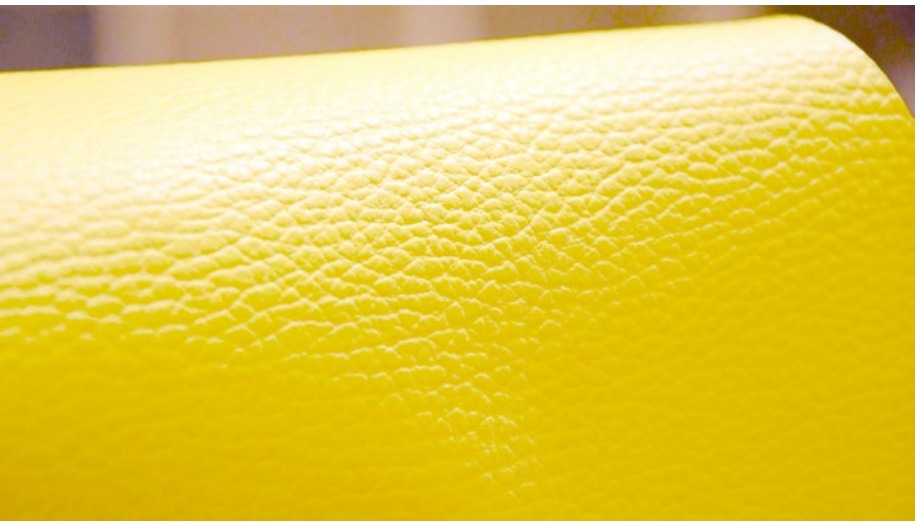
The Future of Sustainable Fashion.
Interview with Anna Pellizzari, Materially

Emma Gambardella
Politecnico di Milano_Italy

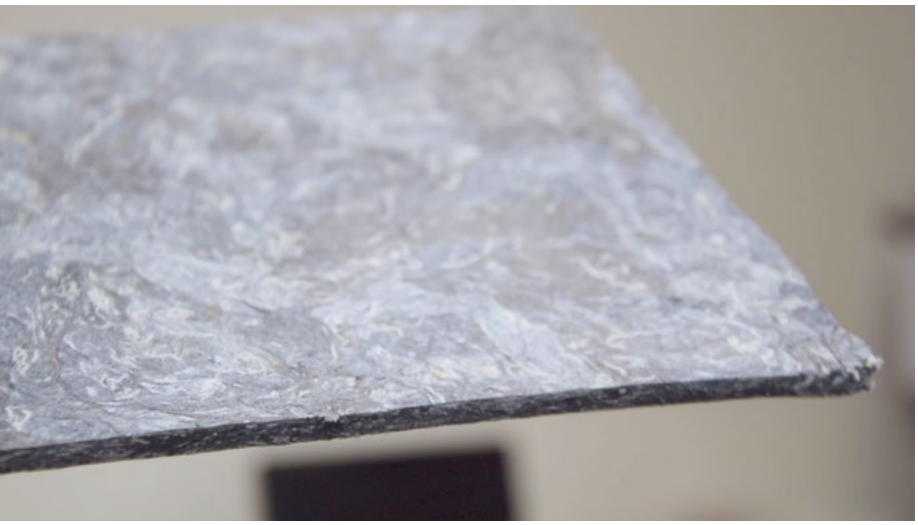
My video wants to address the principal responsibility for the deep pollution provoked by the Fashion System to the Fast Fashion companies. Beside the fact that they istigate a useless and dangerous over-production, they also set an economic parameter that is impossibile to reach respecting sustainability rules, in terms of fair trade, logistics and, above all, materials and fabrics choices and disposal. Materials are on this stage the main actors. I Interviewed Anna Pellizzari, Executive Director of Materially, a consultancy agency of sustainable and innovative materials for Fashion, Design, Automotive etc. She states that one of the goals would be, for example, going for mono-material solutions, more easily disposable and recyclable. And of course finding and creating innovative fabrics. She have showed me some of the main innovations that Italian companies are developing in this sense, covering more sustainable ways: from organic materials, to recycled ones and to upcycled ones as well. For examples skin of pineapple instead of animals leather, denim waste used for multi-uses panels, or orange peel leather and others.

During the round table I have been asked if I noticed a change in the fashion companies in this sense and my point of view has not been that positive. This topic is surely on trend now,
but I believe is mainly belonging to marketing and, as it is called, “greenwashing”; being sustainable is nowadays what makes a company cool, but often some little sustainable “skins”, hide all the rest of the company philosophy which does not consider the environment, the workers rights and none of the other sustainable parameters, but just their possibility of earning. Another interesting topic that emerged from the round table, was the one of Metaverse. As someone states, this can be a way how to face with the over production: creating clothes, among also other products, digitally, for the virtual version of ourselves living in this parallel virtual world. So I want to close with this question: do we really believe replacing the real world and real humans, with a fake virtual one is a solution to face pollution and over consumption? Do we, fashion designers, as one of the most cherished role in this Metaverse, want to contribute
to such an end?

Frame 1. Cover, sustainaility



Frame 2. Leather tanned with 100% natural components. By Conceria Nuvolari



Frame 3. Panel made out of denim waste. By Nazena

Janice Accioly Ramos Rodrigues
Universidade Federal do Paraná_Brazil

In relation to Slow Fashion, it means a rethinking about the actions involving the user can use a piece of rental service, buy in a secondhand market, or purchase a piece and not buy another for a long time. [Frame 1].
About technology it has manifested in fashion in several ways, such as digital printing, digital embroidery, artificial intelligence, 3D printing, digital clothing, etc. [Frame 2].
Upcycling is a technique for adding value to a product that would otherwise be discarded. It means to extend the life of a material by using it in a new part or to modify an existing one.
Co-creation is the creation together. It means involving customers, potential customers, employees' suppliers, and business partners in the product development process, from the initial stages.
Transparency means the public disclosure of reliable detailed and comparable data about policies, commitments, practices, etc of a company throughout its value chain. [Frame 3].

In relation to the other works presented as "Positive impact of fashion: value system beyond consumption and improving design process", "Sustainable fashion?" and "Fast to slow. New visions for the future of conscious fashion system" it is important to say that they all have a great connection. Besides dealing with sustainability, fashion, and the future, they address common themes such as slow fashion; new technologies to implement fashion work and allow a smaller and more personalized production; new materials, replacing traditional ones, to save natural resources; a less unbridled consumption; education cooperating for the consumer to rethink his values.

SLOW FASHION

The other example is **Flávia Aranha fashion design** that manufactures **timeless clothes**, use a **biodegradable material**, based on organic farm, **artisan processes** of **natural dyeing** and reducing the negative impacts of waste by the production (Ruthschilling, 2020).

Frame 1. Slow Fashion and a example of this pratice.

TECHNOLOGY

An example of someone who has already practiced this is Danit Peleg with a **3D printing clothes.** People can buy a STL file or a full kit to print their clothes, after seeing how the digital garments look through the Instagram filter "3DP fashion NFT"

Frame 2. Technology and a example of this pratice.

TRANSPARENCY

An example of this practice is fashion blockchain project by Provenance and Designer Martine Jarlgaard: Availability, in the GRcode on the label, of the clothing movement map, that is, from the extraction of raw material to the distribution of clothing.

Frame 3. Transparency and a example of this pratice.

Fast to Slow. New visions for the future of conscious fashion system

Valentina Alfieri, Silvestro Di Sarno
Università degli Studi della Campania “Luigi Vanvitelli”_Italy

According to the Bloomberg website, the waste that fast fashion produces is about 11.3 tons of waste every year in the only United States, of which only a small part is actually recycled. Based on this data, our video analysed the possible future scenarios of a slow fashion, in tune with the environment and its living species. The ecological transition could be achieved by following a holistic approach, with a *regenerative agriculture* where crops are not forced and workers work at an appropriate way. The virtual reality of the *Metaverse* could also reduce environmental impact: with digital collections the rithm of production and delivery would slow down, making production more sophisticated while consumers would have a much more intense shopping experience and be aware of the value of a garment thanks to the wait for delivery. This strategy could seriously lead to balancing supply and demand to the point of zero waste. We absolutely need to move towards a slow and conscious fashion, looking out into the virtual world, which opens up to new possibilities of design and prototyping.

In our view, talking about a real sustainability today is still not possible as we recognise an abuse of this term, the true meaning of which and what it implies is ignored. Therefore, it is essential to increase information about the negative effects of fast fashion through effective and direct communication to ensure that the paradigm shift starts with the consumer that must change habits. This is the only way to convert even fashion companies that, unfortunately, are increasingly green washing. Secondly, we need to be far-sighted and go into schools to educate young people to think ethically and sustainably from an early age. In both cases, we believe it is possible and right to exploit the technological tools at our disposal in a positive and constructive manner, both in communication and in production, while studying new solutions that can reduce the energy consumption resulting from the use of technology.

Frame 1. Fast to Slow. New visions for the future of conscious fashion system. *Negative impact of fast fashion. We need a change*.

Frame 2. Fast to Slow. New visions for the future of conscious fashion system. *Ecological Transition, towards a slow fashion with a holistic approach.*

Frame 3. Fast to Slow. New visions for the future of conscious fashion system. *Digital Transition as a viable alternative to reduce the environmental impact of fast fashion.*

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(Italy)

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Vice Rector of Informatics and Technological Innovation
at Università degli Studi della Campania “Luigi Vanvitelli”
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(Tukey)

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(Italy)

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(Italy)

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(Italy)

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(Portugal)

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(USA)

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(Netherlands)

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(Turkey)

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Özyeğin University
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(Italy)

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Escola Superior de Artes e Design - ESAD, Matosinhos-Porto (Portugal)

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University of Thessaly
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Nur UMAR
Adana Alparslan Türkeş University of Science
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Università degli Studi della Campania “Luigi Vanvitelli”
(Italy)

Ornella ZERLENGA
Università degli Studi della Campania “Luigi Vanvitelli”
(Italy)

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	Rosa DE CARO	
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	Rosina IADEROSA	
	Gennaro Pio LENTO	
	Marica MEROLA	
	Riccardo MIELE	
	Enrico MIRRA	

VENUE

City information – San Leucio is a fraction of the municipality of Caserta known for its historical and artistical history located 3.5 km northwest of the city. The royal site has been recognized as a World Heritage Site by UNESCO and in it covers an area of 16.871 m².In 1773 Ferdinand IV wanted to build a solitary retreat where to spend his free time and he chose exactly the hills that flanked the Caserta Park where there was a chapel dedicated to San Leucio, the martyr bishop of Brindisi, from whom the site took its name. On the death of the king's eldest son, Carlo Tito, he decided to erect a hospice for the poor where he assigned a factory so as not to keep them idle. The colony grew rapidly so it was decided to build more buildings to improve its functionality. The silk factory workers were assigned a house inside, and free education was also provided for their children, being able to benefit from the first compulsory school in Italy. King Ferdinand IV of Bourbon planned to enlarge the colony also for the new industrial needs due to the introduction of the "reeling" of silk and the manufacture of veils, therefore to build a new city, to be called Ferdinandopoli, conceived on a completely circular plan. He did not succeed, but in the neighborhoods annexed to the Belvedere the silk orders even today, they still come from all over Europe: nowadys, the productions of San Leucio can be found in the Vatican, at the Quirinale, in the Oval Office of the White House: even the flags of Buckingham Palace are made with this material.

Site information – Officina Vanvitelli, born within the activities of the Department of Architecture and Industrial Design, is a light district for fashion and design in Campania. It is both a space for experimentation and innovation, a meeting place for minds, cultures and different skills. It is the space where ideas fall into solid matter, becoming visible and active. It is also the place where the new floating factory takes shape, capable of incorporating knowledge into material products and services and launching them into the world.It is the place of confrontation with companies, productive realities, institutions and bodies that represent the complex reality of the territory and its geographies, not only physical, but cultural and social, with the aim of continuously identifying new scenarios, knowledge and relationships for one development based on an "industry of cultures".

Officina Vanvitelli encourages the scouting and realization of the projects of creative talents, experimenting with new paths to offer tangible and intangible opportunities, as well as public / private investments.

Officina aims to bridge the gap that still exists between academic training and the world of fashion and design companies in its various connotations: consolidated, emerging companies, start-ups, spin-offs, and will collaborate closely with the production reality for the development of new professions and the business of the future.
The headquarters was inaugurated on 23 January 2019, on that occasion the Department of Architecture and Industrial Design conferred an honorary degree on Rosita Missoni, founder of the famous brand.

Università
degli Studi
della Campania
Luigi Vanvitelli

SERVICES COMPANIES

Digital platform

Technical secretariat

PROGRAM

11 May / morning_Hall 1

8.00–8.30 | Registration of participants

8.30–9.30 | **INSTITUTIONAL GREETINGS**

Honorary Committee

Giovanni Francesco Nicoletti – Rector of Università degli Studi della Campania "Luigi Vanvitelli"

Selçuk Geçim – Pro-Rector Cankaya University (remotly)

Pieter De Wilde – In representation of the University of Strathclyde Principal

Italo Francesco Angelillo – Pro-Rector of Università degli Studi della Campania "Luigi Vanvitelli"

Luigi Maffei – Pro-Rector for Technological and Computer Science Innovation of Università degli Studi della Campania "Luigi Vanvitelli"

Ilaria Fontana – Italian Parliament Member, Undersecretary of State at the Ministry of Ecological Transition

Massimiliano Smeriglio – European Parliament member (remotly)

Carlo Marino – Mayor of Caserta

Raffaele Cecoro – President of the Ordine degli Architetti PP&C of Caserta province

9.30 –11.00 | **INTRODUCTIONS**

Ermete Realacci – President of SYMBOLA. Fondazione per le qualità italiane (remotly)

Maurizio Tira – President of Società degli Urbanisti Italiani (SIU)

Mario Losasso – President of Società Italiana della Tecnologia dell'Architettura (SITdA)

Andrea Sciascia – President of Società Scientifica Nazionale di Progettazione Architettonica (ProArch) (remotly)

Francesca Fatta – President of Unione Italiana Disegno (UID)

Francesca Tosi – President of Conferenza Universitaria Italiana del Design (CUID)

Raimonda Riccini – President of Società Italiana di Design (SID)

Paolo Rosato – President of Società Italiana di Estimo e Valutazione (SIEV)

Paolo Giordano – Coordinator of PhD Course in Architecture, Industrial Design, and Cultural Heritage – Università degli Studi della Campania "Luigi Vanvitelli"

Lorenzo Imbesi – Member of Cumulus Executive Board

Carlo Vezzoli – Co-founder of Learning Network on Sustainability International (LeNS)

11.00 –11.30 | **COFFEE BREAK GARDEN**

11.30 –12.30 | **OPENING CONFERENCE**

Conference Presidents

Ornella Zerlenga – Director of the Architecture and Industrial Design Department (DADI), Università degli Studi della Campania "Luigi Vanvitelli"

Gediz Urak – Dean of The Faculty of Architecture, Cankaya University (remotly)

Stephen McArthur – Executive Dean and Associate Principal of The Faculty of Engineering, University of Strathclyde

Conference Chairs

Claudio Gambardella – Università degli Studi della Campania "Luigi Vanvitelli"

Pieter De Wilde – University of Strathclyde

Timuçin Harputlugil – Çankaya University

12.30 –13.30 | **Keynote Speakers**

Ezio Manzini – Politecnico di Milano

Patrizia Ranzo – Università degli Studi della Campania "Luigi Vanvitelli"

11 May / afternoon_Hall 1

13.30 – 15.00 | **LUNCH**

15.00 – 16.30 | **13 For Nature / With Nature: new sustainable design scenarios**
Chair Lorenzo Imbesi

Güniz Sağocak, Gülru Mutlu Tunca
Game Experience: A Fun Form of Cultural Sustainability
Feifei Song
ADHEREND - Research and teaching design on the integration of old and new urban spaces
Fabio Naselli, Anna Yunitsyna, Claudio Gambardella, Valentina Sapio
Sustainability of the 3D printing process and settlements' codesign
Chiara Lorenza Remondino
A renewed poetic practice. Rethinking the role of packaging design to boost New Normality
Claudia Morea, Sofia Collacchioni, Francesca Falli, Chiara Rutigliano
Collaborative services as trigger for a sustainable culture: two case studies
Giulio Giordano
Revived Vintage objects:
Designing and Recycling as a bridge connecting Period Products to contemporary functions

16.30 – 16.45 | **COFFEE BREAK GARDEN**

16.45 – 18.45 | **12 Design for Sustainable & Safe Communities**
Chair Carla Langella

Luigi Maffei, Francesca Castanò, Raffaella Marzocchi, Maria Dolores Morelli
Slowork, room with view. Behaviors, Heritage, Design for new lifestyles
Niccolò Casiddu, Claudia Porfirione, Annapaola Vacanti, Francesco Burlando, Isabella Nevoso
Living Hub: setting up a living for simulation-based design activities
Nicola Corsetto, Patrizia Ranzo, Francesco Fittipaldi
I.S.A.R.C – Innovative System for Aerial and Rescue Controls
Xiaowen Wu, Claudio Gambardella
Sustainable design in urban renewal: A case study of waterfront landscape infrastructure of Shanghai, China
Timuçin Harputlugil, Pieter De Wilde
Beyond current limits: building occupants and climate change
Kihara Wellington Minoru, Aguinaldo dos Santos, Ana Lucia Zandomeneghi, Alexandre De Oliveira
Design For Sustainable Behavior: Strategies for Understanding Behavior Change
Gülser Çelebi, Meron Belay
Analyzing sustainability of green product certification systems using indicators of sustainable product
Ayca Odabasi Uyanik
Building Trust to Level 4 Autonomous Trucks for Enviromental Sustainability and Road Safety

11 May / afternoon_Hall 2

13.30 – 15.00 | **LUNCH**

15.00 – 16.30 | **05 Circular Technological Design for a carbon neutral approach**
Chair Mario Rosario Losasso

Jacopo Andreotti, Roberto Giordano
How to pursue the Whole Life Carbon vision: a method to assess buildings' Embodied Carbon
Serena Baiani, Paola Altamura
C2C as a reference framework for circular buildings. Implementation on an existing settlement in Rome
Antonella Violano, Nicola Barbato, Monica Cannaviello, Souha Ferchichi, Imad Ibrik, Ines Khalifa, Jose Luis Molina, Antonella Trombadore
Digital-green transition of knowledge buildings
Antonella Trombadore, Gisella Calcagno, Giacomo Pierucci, Lucia Montoni, Juan Camilo Olano
University communities for the green/digital renovation of buildings
Antonella Violano, Antonio Maio
Metamorphosi Vs Transformation: innovating the process in the regeneration technological design of heritage-built environment
Marica Merola, Chiara Tosato
Slow tourism and sustainable mobility: infrastructures for a smart use

16.30 – 16.45 | **COFFEE BREAK GARDEN**

16.45 – 18.45 | **10 Re-shaping planning approaches, tools and processes for a sustainable, inclusive, and resilient future**
Chair Ferdinando Trapani

Penghan Wu, Yedian Cheng
Museum and the Community: A Case of Participatory Intervention of An Old Community in Shanghai
Adriana Galderisi, Giuseppe Guida, Giovanni Bello, Giada Limongi, Valentina Vittiglio
Improving learning capacity to enhanceresilience: the community engagement process in the RI.P.RO.VA.RE. Project
Claudia De Biase, Salvatore Losco
To a sustainable redevelopment of illegal settlements
Elisavet Thoidou, Miltiadis Toskas-Tasios
Spatial Planning and Energy Transition: The role of public participation
Claudia Sorbo
Risk-connect: a secure and ecological path in the east side of the Vesuvio National Park
Deniz Altay-Kaya, Damla Yeşilbağ
Cultural Heritage in Resilience Planning: Evidence from 100 Resilient Cities Database
Macarena Gaete Cruz, Aksel Ersoy, Darinka Czischke, Ellen Van Bueren
A framework for socio-ecological urban co-design: Lessons from two urban parks in the Atacama Desert
Adriana Figurato
Spas, new possible scenarios for human and city's wellbeing

11 May / afternoon_Hall 3

13.30 – 15.00 | **LUNCH**

15.00 – 16.30 | **02 History, resilience, and green transition**
Chair Anna Giannetti

Elena Manzo, Marina D'Aprile, Antonella Violano
The enhancement of Biocultural landscapes: history, heritage, and environment driving sustainable mobility in internal areas
Irem Kahyaoğlu, Timuçin Harputlugil
Conceptual framework for adaptive reuse of cisterns to cope with climate change and global warming: case of Safranbolu
Chiara Ingrosso
Patrick Geddes in Naples. The beginning of his ecological thinking
Monica Esposito
Klampenborg: between local identity and territorial development. An example for Campania's spas
Felicia Di Girolamo
Vlorë, the ancient city of Albania and its history in Giuseppe Rosaccio's travel diary
Federica Fiorillo
New culture of mobility between flow of people and flow of ideas. Two examples of Metro's transformation: Naples and Copenhagen.

16.30 – 16.45 | **COFFEE BREAK GARDEN**

16.45 – 18.00 | **13 For Nature / With Nature: new sustainable design scenarios**
Chair Claudio Gambardella

Ivo Caruso, Vincenzo Cristallo
Nature-based design methods and practices for bathing activities sustainability
Mario Bisson, Stefania Palmieri, Alessandro Ianniello, Luca Botta, Riccardo Palomba
Design for social innovation: a proposal for an holistic design approach
Francesca La Rocca
Beyond the XX century's object:12 keywords from the international design scenery
Alessia Romani, Federica Mattiuzzo, Marinella Levi
Design for and with visual impairments through 3D printing: a case study from the covid-19 pandemic
Simona Ottieri
Design and craftsmanship for urban regeneration

12 May / morning_Hall 1

9.30 – 11.00 | **14 Next Consciousness. Fashion innovative scenarios, processes, and products**
Chair Gabriele Monti

Alessandra Cirafici, Carlos Campos
DENIM_DECONSTRUCTION. Industrial garments/random garments. Up-cycling processes
Rosanna Veneziano, Michela Carlomagno
Platforms, algorithms, and new media in the prosumer era. The evolution of tailored production in Fashion and Cosmetic field
Dalia Gallico
Collaborative sustainable innovation improving inclusiveness and value adding capabilities
Chiara Scarpitti, Flavio Galdi
Seven Bodies. Parametric design dialogues around the body
Valentina Alfieri
New scenarios of conscious fashion system
Patrizia Marti, Annamaria Recupero
Smart jewels for inclusive fashion

11.00 – 11.15 | **COFFEE BREAK GARDEN**

11.15 – 13.00 | **14 Next Consciousness. Fashion innovative scenarios, processes, and products**
Chair Gabriele Monti

Sabrina Lucibello, Lorena Trebbi
Alginate Materials for Circular Fashion: from Consumptive to Regenerative Systems
Elisabetta Cianfanelli, Margherita Tufarelli, Maria Claudia Coppola
Metamorphosis with(in) fashion: futuring through a new fashion design framework
Giulia Scalera
Responsible Italian Fashion. An open brand for sustainability in fashion
Cristina Marino, Sara Bellini
Designing a Conscious Fashion Experiences: strategies for Generation Z
Maria D'Uonno
Futurable fashion state of mind. Sustainable projects and theories for new fashion system scenarios
Maria Antonietta Sbordone, Carmela Ilenia Amato, Alessandra De Luca, Venere Merola
New bio-based textiles productions increasing new circular economy models
Ornella Cirillo, Andrea Chiara Bonanno, Caterina Cristina Fiorentino, Roberto Liberti, Giulia Scalera
Linen Storylines in Procida. From memory to con"temporary" project, between diffusion of knowledge and sharing of practices

12 May / morning_Hall 2

9.30 – 11.00 | **08 High Performance Components & Buildings**
Chair Pieter De Wilde

Luigi Maffei, Antonio Ciervo, Dorian Diodato, Antonio Rosato
Prefabricated movable modular building solutions exploiting renewable sources: energy systems review
Niloufar Mokhtari, Giovanni Ciampi, Yorgos Spanodimitriou, Sergio Sibilio
Second-skin façades and usage of textile materials in the building envelope: literature review, limitations, and future opportunities
Ahmet Ethem Çulcuoğlu, Timuçin Harputlugil
A research on thermal defects in building envelopes for mid-rise houses to develop retrofit strategies: implemented with a case study in Sivas/Turkey
Giovanni Ciampi, Yorgos Spanodimitriou, Michelangelo Scorpio
Review of 3D Printing in Architecture: applications, limitations, and future developments
Evelyn Grillo
From climate change to the development of adaptive building envelope
Michela Musto
Advanced manufacturing processes for emergent architectural systems

11.00 – 11.15 | **COFFEE BREAK GARDEN**

11.15 – 12.45 | **09 Public policies for inclusive and sustainable cities**
Chairs Mercedes Isabel Aveldaño - Marco Calabrò

Scilla Vernile
The environment: from limit to economic opportunity
Floriana Pollio
The role of sustainable disclosure and reporting in the public administration: the AdSP case of the western Ligurian sea
Cecilia Padula, Silvia Barbero
The impact of COVID-19 on Piedmont Circular Economy policy roadmap
Laura Pergolizzi
Urban regeneration through an integrated urban planning approach: towards a new paradigm. The Italian experience
Benedetta Terenzi
Brand urbanism and future scenario to promote sustainable buses public transport. A case study
Marco Francesco Errico
Common goods: an instrument for citizen inclusion and urban regeneration

12 May / morning_Hall 3

9.30 – 11.00 | **06 Structural engineering**
Chair Alberto Mandara

Corrado Chisari, Mattia Zizi, Daniela Cacace, Gianfranco De Matteis
Seismic vulnerability assessment of bell towers in Naples
Androniki Christodoulou, Olympia Panagouli, Athanasios Kozanitis
The role of the epistyle on the dynamic behavior of multi-drum columns
Claudia Cennamo, Concetta Cusano, Luigi Guerriero
Seismic Retrofit of Masonry Structures: the Lancellotti Palace in Casalnuovo di Napoli
Giorgio Frunzio, Mariateresa Guadagnuolo, Luigi Massaro, Luciana Di Gennaro
The CLT panels: a sustainable response for existing buildings
Gianfranco De Matteis, Pasquale Bencivenga, Angelo Lavino, Francesco Rosselli, Mattia Zizi
Conservation state and structural issues of existing infrastructures: the case of statal road bridges in Campania
Euripidis Mistakidis, Olympia Panagouli
Use of structural steel in cultural heritage and for the strengthening of existing structures

11.00 – 11.15 | **COFFEE BREAK GARDEN**

11.15 – 12.30 | **03 Restoration: a sustainable answer to uncontrolled urbanization**
Chair Andrea Pane

Paolo Giordano
Restoration of the architectural heritage. The cemetery hill of Poggioreale in Naples
Corrado Castagnaro
Restoration as a sustainable resource for urban regeneration. The case of the Forte di Vigliena
Domenico Crispino
Recovery of the abandoned heritage towards new fruitive horizons: the case of S. Maria della Pace
Enrico Mirra, Adriana Trematerra
Harbour heritage protection: sustainable practices for the enhancement of the Balkan Coast
Adriana Trematerra, Florian Nepravishta, Enrico Mirra
Abandoned heritage between restoration and valorisation: Mirine Early Christian Basilica in Croatia

12 May / afternoon_Hall 1

13.00 – 14.30 | **LUNCH GARDEN**

14.30 – 16.00 | **07 Occupants and their interaction with the built environment related to Multisensorial and Indoor Environmental Quality**
Chair Timuçin Harputlugil

Samiha Boucherit, Luigi Maffei, Massimiliano Masullo
Inclusive design and the multisensory interactions in public spaces for well-being of visually impaired people
Merve Coşar Güzel, Gülsu Ulukavak Harputlugil
Natural Ventilation Strategies in Buildings as Part of Indoor Air Quality and Healthy Environment
Alessandro Meloni
Compared spatial interpretations in the Edoardo Chiossone Museum of Oriental Art
Ainoor Teimoorzadeh, Michelangelo Scorpio, Giovanni Ciampi, Sergio Sibilio
Head Mounted Displays for lighting in Virtual Reality: Review on Measurements, Advances, and Limitations
Michelangelo Scorpio, Davide Carleo, Martina Gargiulo, Pilar Chias Navarro, Yorgos Spanodimitriou, Parinaz Sabet, Giovanni Ciampi
The role of the subjective assessment in lighting research using virtual reality
Francesco Salamone, Giorgia Chinazzo, Ludovico Danza, Clayton Miller, Sergio Sibilio, Massimiliano Masullo
On the use of low-cost thermohygrometers for wearable application in the built environment

16.00 – 16.15 | **COFFEE BREAK**

16.15 – 18.15 | **01 Survey and Representation as system of monitoring and action on the risk factors and conditions of the context**
Chair Maria Ines Pascariello

Ornella Zerlenga, Rosina Iaderosa, Margherita Cicala
Digital images for the knowledge of bell towers and their ornamental signs
Alessandra Cirafici, Caterina Cristina Fiorentino
Naples, Leopardi and the Artist/Inhabitant Project. Practices of aesthetic resistance
Gennaro Pio Lento, Rosa De Caro, Fabiana Guerriero
Representation of territorial identities of Panagia Paraportiani in Mykonos
Alice Palmieri
Digital narratives for cultural heritage: new perspectives for accessibility and inclusion
Vincenzo Cirillo, Riccardo Miele
The identity drawing of places. Bell towers in sixteenth-century Naples by Antoine Lafréry
Valeria Marzocchella
New technologies fot the city and landscape. A versatile application example
Rosa De Caro, Fabiana Guerriero, Gennaro Pio Lento
Knowledge and representation of the civic tower of Tora and Piccilli
Luigi Corniello, Angelo De Cicco
The photogrammetric survey of the Tvrdalj Fortress in Hvar

18.15 – 18.45 | **FINAL PLENARY SESSION**

Luigi Maffei – Pro-Rector for Technological and Computer Science Innovation of Università degli Studi della Campania “Luigi Vanvitelli”
Pieter De Wilde – University of Strathclyde
Timuçin Harputlugil – Çankaya University
Claudio Gambardella – Università degli Studi della Campania “Luigi Vanvitelli”

12 May / afternoon_Hall 2

13.00 – 14.30 | **LUNCH GARDEN**

14.30 – 16.00 | **11 Beautiful, sustainable, and inclusive places: the role of appraisal and evaluation**
Chair Pasquale De Toro

Maria Cerretta, Chiara Mazzarella, Hilde Remoy
Nomad Management of Urban Development: the complex value of temporary communities
Luciano Lauda, Fabiana Forte
The value of change: towards social impact assessment in Scampia
Adriana Ghersi, Silvia Pericu, Federica Delprino, Stefano Melli
Pays Aimables: visual storytelling and landscape values
Federica Cadamuro Morgante, Alessandra Oppio, Chiara Sumiraschi
Evaluation issues of cultural heritage impact-led regeneration processes. The case of Italian inner areas
Leopoldo Sdino, Francesca Torrieri, Marta Dell'Ovo, Marco Rossitti
Con(temporary) urban regeneration processes and real estate market: evidence from the case of Milan
Ali Turel
Turkey is the Leading Housing Producer in Europe with Dominating Equity Finance in Housing Transactions

16.00 – 16.15 | **COFFEE BREAK**

16.15 – 17.30 | **11 Beautiful, sustainable, and inclusive places: the role of appraisal and evaluation**
Chair Pasquale De Toro

Maria Cerretta, Ludovica La Rocca, Ezio Micelli
A Decision Aid and Social Impact Co-Assessment Approach for Urban Regeneration Processes
Fabiana Forte, Alessandra Oppio
Beauty as value: evaluation issues in the NEB perspective
Zeynep Çiğdem Uysal Ürey
Creation of a Pseudo-Vernacular Architecture and the Unintentional Attainment of Sustainability: The Case of Akyaka Town Development
Fabrizio Battisti, Giovanna Acampa, Mariolina Grasso
Using evaluation tools in urban regeneration processes
Fabiana Guerriero, Rosa De Caro, Gennaro Pio Lento
Unesco heritage and spatial analysis in a GIS environment

12 May / afternoon_Hall 3

13.00 – 14.30 | **LUNCH GARDEN**

14.30 – 16.00 | **04 Urban transformations: projects, strategies, actions**
Chair Renato Capozzi

Paolo Belardi, Valeria Menchetelli, Giovanna Ramaccini, Monica Battistoni, Camilla Sorignani
Learning from Covid 19. Sustainable strategies for the regeneration of peripheral areas
Francesco Costanzo, Gaspare Oliva, Michele Pellino
Historical city and urban voids as elements of cultural heritage: theory and projects for Aversa discontinuous city
Raffaele Marone
Architecture from rubble. To “rebuild the imaginary”
Luisa Collina, Laura Galluzzo, Claudia Mastrantoni, Elisa Cinelli
Sustainable Recovery and Urban Public Transformation of a Former Military Park
Barbara Bonanno
The man who designed his city. The Matteotti village in Terni by Giancarlo De Carlo as a socially sustainable method
Rabia Çiğdem Çavdar
Rereading of the Process of an Idea Competition for Obtaining a Sustainable Urban Environment

16.00 – 16.15 | **COFFEE BREAK**

16.15 – 17.15 | **04 Urban transformations: projects, strategies, actions**
Chair Renato Capozzi

Caterina Frettoloso, Rossella Franchino, Paola Gallo
Urban environments regeneration. Technological issues for adaptive re-use
Maria Giulia Atzeni
A Scattered Courtyard: rediscovering the Historical Palimpsest of Xi’an for regenerating the urban texture along the City Wall
Concetta Tavoletta
Second-hand Architecture. For a new theory of reuse. The case of the EX IDAC FOOD
Marco Russo
Resonant void. Play and interaction in architecture

14.30 – 16.30 | **ROUNDTABLE – THE FUTURE OF SUSTAINABLE FASHION**

Chair Aguinaldo dos Santos
Co-chairs Roberto Liberti, Maria Antonietta Sbordone

VIDEOS

Anikó Gál – Hungary
Positive impact of fashion: value system beyond consumption
and improving design process
Emma Gambardella – Italy
Sustainable fashion?
Janice Accioly Ramos Rodrigues – Brazil
The future of work in fashion from the perspective of technologies: a prospective study
Valentina Alfieri, Silvestro Di Sarno – Italy
Fast to slow. New visions for the future of conscious fashion system

13 May / Social program

8.30 | Caserta Station

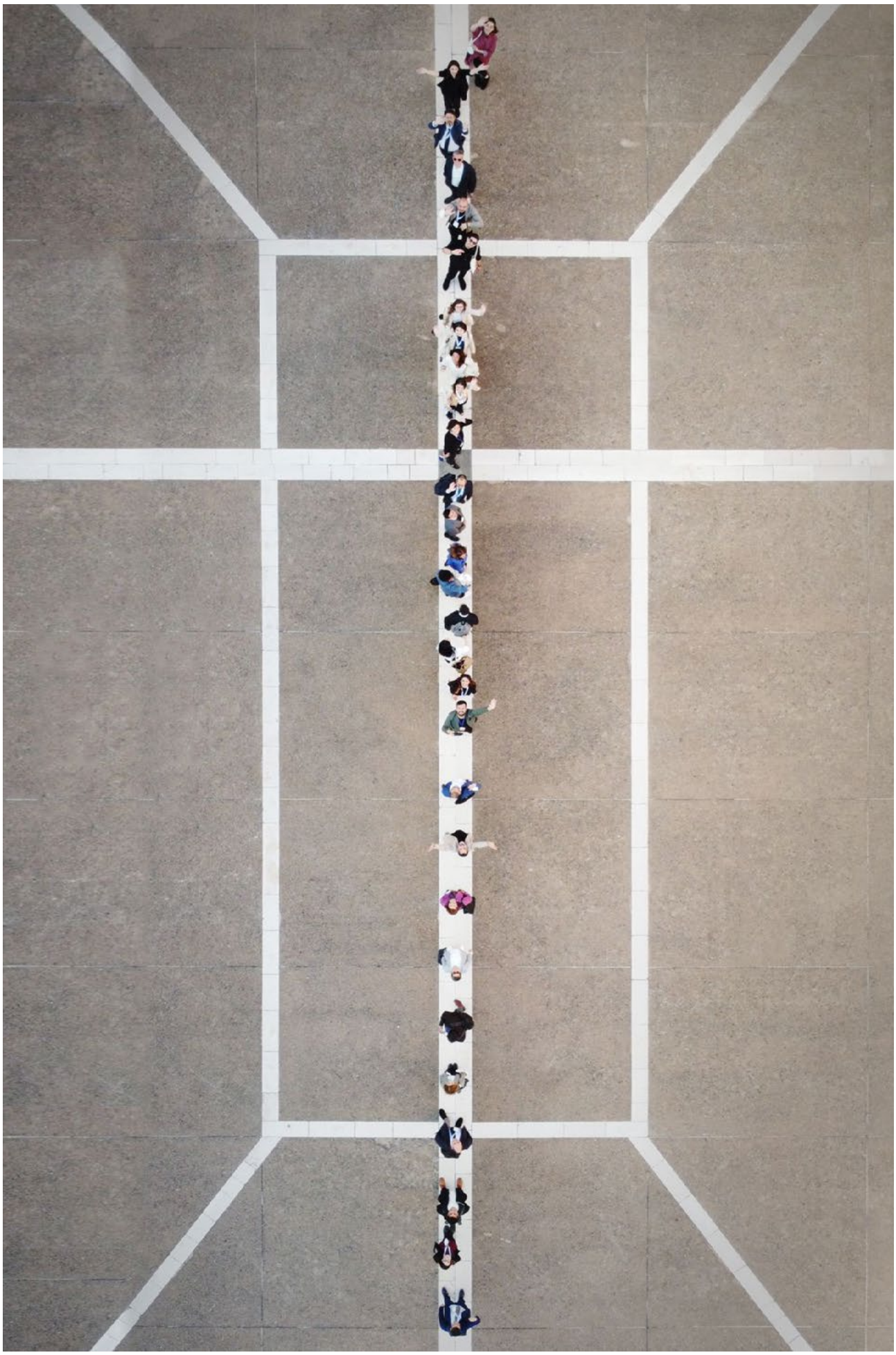
9.00 | Real Belvedere Silk Museum
11.30 | Royal Palace of Caserta

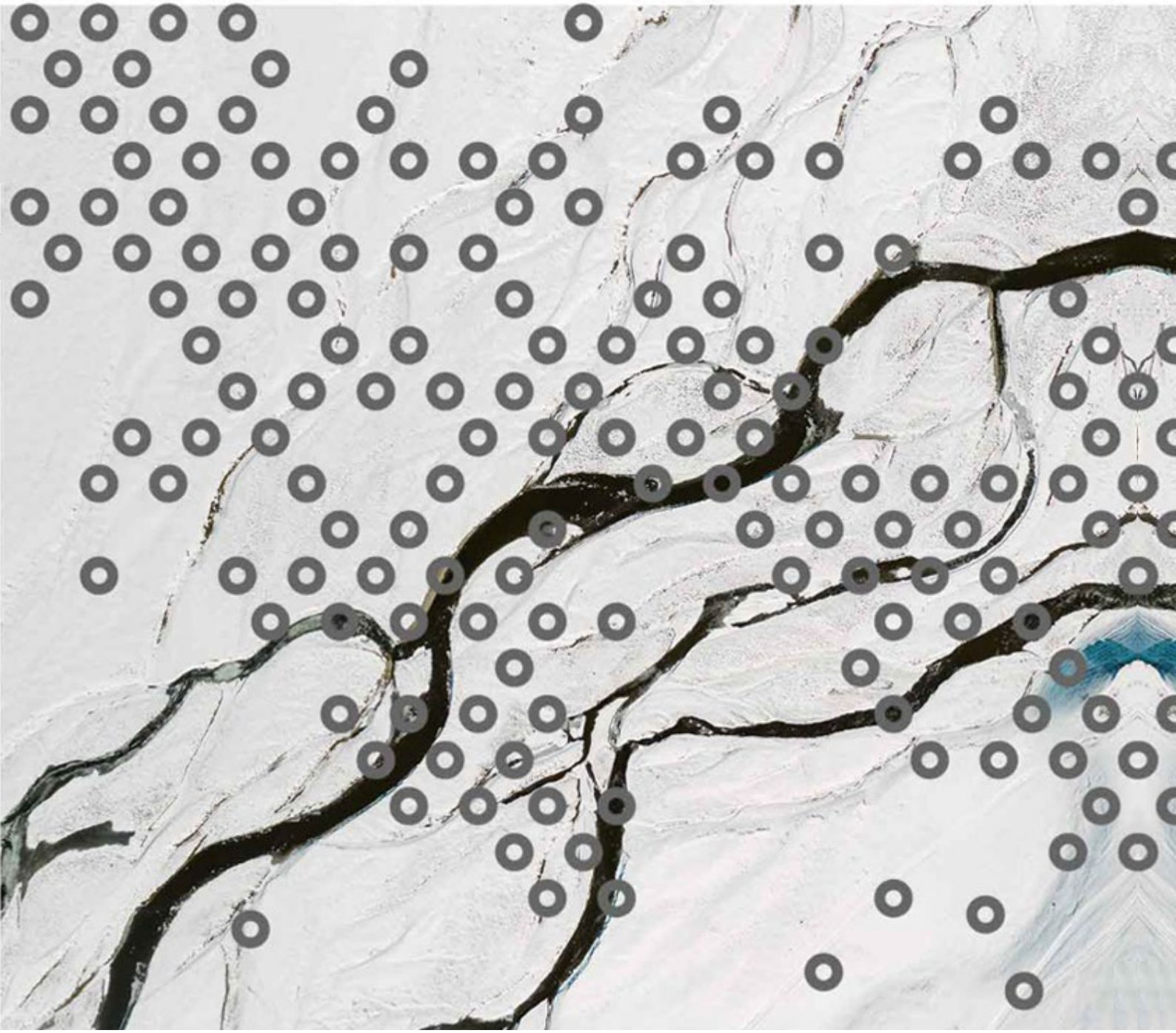
13.30 | SHORT LUNCH BREAK

16.00 | Royal Site of Carditello Foundation
18.00 | Casertavecchia medieval village

20.00 | DINNER

21.30 | Caserta Station





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