STEP UP

Walkability for Women in Milan

Editors
Lily Scarponi, Andrea Gorrini, Gerardo Carpentieri

Preface
Margot Rubin
Cardiff University

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Smart City, Urban Planning for a Sustainable Future

City and Sustainable Mobility

12

STEP UP
Walkability for Women in Milan

Scientific monograph

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PREFACE

Dr Margot Rubin
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Preface

I arrived in Cardiff almost three years ago from Johannesburg, South Africa and the first thing that I noticed, aside from the incredibly awful weather, was that I could walk, almost any time and almost anywhere without fear. This was, and to some extent, remains a novel experience for me and I relish the relatively simple act of being able to walk to friends, to the shops, to work and to walk with my children and not have to keep them in sight every minute. Three years later, I still relish this freedom, but through engaging with friends and colleagues, especially of a variety of ethnicities, as well as through my own research in migrant areas, this joy is slightly tempered. Over the last few years, I have heard stories of how women wearing hijabs and head coverings are choosing to stay and work or study in Cardiff, because here they know where it is safe to go while wearing these signs of their faith but fear harassment in other cities and spaces; I have heard of young men only going out in groups and at certain times for fear of violence. It is clear that my own positionality and identity offer privileges in access and accessibility not enjoyed by all of the women and a number of the men of my acquaintance.

Walking and walkability have become increasingly important topic in debates around transit, transport and mobility over the last decade and certainly since the Covid pandemic. Many governments at a range of levels have developed walking plans and policies, however what is less well-considered and addressed is the role that the individual's identity plays in how people navigate the city. The time, routes taken, whether to walk alone or accompanied and their choice of destination are all influenced by who they are: gender, age, mobility amongst a host of other factors. Very often for women, and more so women of colour, safety and the need to carry out activities related to their gender roles directly impact mobility and walkability. This book, through robust and rigorous methods, looks into the relationship between gender, time and walking in Milan. It also offers a clear commitment to making cities equitable and inclusive for all urban residents.

Through a systematic review of the literature and deep-seated empirical work the STEP UP project brought together elements of gender and intersectional theory, with

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planning principles to investigate the relationship between these features and to provide bottom-up, evidence-led findings for policy-makers and planners. It offers some devastating insights: "63% [of respondents] reported experiencing sexual harassment 'sometimes' or 'often', while 17% reported the same for sexual violence". This means that almost 80% of women going about their daily lives experience some form of gendered violence. Furthermore, it is younger women who are reported to feel the least safe when going out at night. One of the other fascinating sets of findings is what precisely makes women feel unsafe, and whilst there were a number of physical aspects such as lack of street-lighting and obstacles to sight that made women feel unsafe, it was the social issues that caused the greatest concern i.e. being in places where there were only men, and the presence of various forms of anti-social behaviour such substance abuse and sale.

The book engages with these areas of concern but bravely does not shy away from some of the more uncomfortable aspects of gendered perceptions of safety and investigates the relationship between prejudice and perceptions of danger. The team also engaged with moments of ambiguity with certain groups of men sometimes being seen as positive and safe option such as taxi drivers and police officers, whilst in others having a fairly "limited" role in "enhancing security perception". Whilst private security was sometimes seen as offering more security and being more reassuring.

The multiple methods that were used including surveyed qualitative and quantitative responses, focus groups and the use of spatial data all combine to construct a convincing set of findings that are also upfront about their short-comings and limitations, whilst still provide a very important temporal and spatial analysis of gendered mobility. The intersectional and interdisciplinary framing and analysis merged with a strong analysis of the built environment also makes this book accessible to a number of different disciplines and audiences offering both theoretical insights and practical recommendations, steeped in well though-through pragmatism and best practice. The book and the team behind it have developed a method that is highly replicable in a number of different contexts and I look forward to reading about their next innovations and adventures.

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Executive Summary

Safe and accessible walking environments are crucial for sustainable urban mobility. However, traditional walkability assessments often overlook how user characteristics, particularly gender, influence perceptions of safety. The STEP UP project, awarded by Fondazione Cariplo (Grant No. 2022-1643), addressed this gap by investigating how women in Milan experience nighttime walkability.

Women often navigate cities differently than men due to concerns about safety. Fear of violence or harassment can lead to precautionary behaviors like avoiding certain areas or using alternative modes of transport at night. These safety concerns significantly impact women's mobility and limit their access to essential services and social interactions.

The STEP UP project employed a multimodal approach to understand the factors influencing women's perceptions of safety while walking in Milan at night. This approach combined qualitative and quantitative methods to gain a comprehensive understanding of the issue.

- Literature review: A comprehensive review of existing research established the theoretical framework for the project. It identified key factors influencing women's nighttime safety perceptions, including spatial features (street design, lighting), social dynamics (presence of others), and personal characteristics (age, socioeconomic background);
- Survey and focus groups: An online survey garnered over 1800 responses from Milan residents, providing valuable data on how gender and socioeconomic status intersect with safety perceptions. Focus group discussions in three neighborhoods (high, medium, and low safety perception areas) offered rich qualitative insights into women's lived experiences;
- GIS mapping: The project leveraged Geographic Information Systems (GIS) to analyze the spatial distribution of safety concerns. Safety data crowdsourced through the "Wher" App (a safety reporting app) was integrated with open data on relevant factors like public lighting, public transport frequency, and nighttime business activity.

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The STEP UP project yielded crucial findings that contribute to the understanding of gendered nighttime walkability:

- Gendered differences: The survey data confirmed significant variations in safety perception between genders and across socioeconomic groups. Women, particularly those from lower socioeconomic backgrounds, reported feeling less safe at night.
- Qualitative insights: Focus groups provided in-depth understanding of the specific safety concerns women face in different neighborhoods. Factors like poor lighting, deserted streets, and lack of visible social activity emerged as key contributors to feelings of insecurity.
- Spatial analysis: The GIS analysis identified areas in Milan where interventions to improve safety perceptions are most needed. It revealed a strong correlation between the presence of adequate public lighting, frequent nighttime public transport, and open businesses at night with higher reported safety scores from the Wher App.

The STEP UP project acknowledges limitations inherent to its methodology. The reliance on the Wher App data raises concerns about representativeness, as user demographics may skew towards younger age groups. Additionally, the availability of open data limited the analysis of certain safety factors. Finally, the quantitative approach, while valuable, inherently simplifies complex social phenomena.

Future research should address these limitations by incorporating data from more diverse user groups and exploring additional safety factors. Mixed-methods approaches that combine quantitative and qualitative data collection can provide a more nuanced understanding of gendered nighttime walkability.

The STEP UP project offers valuable insights for researchers and urban planners seeking to create more inclusive and gender-equitable cities. By highlighting the importance of considering women's nighttime safety needs, the project contributes to the development of sustainable and just urban mobility solutions. The findings on the correlation between key factors like lighting, public transport, and nighttime business activity with safety perceptions provide a practical framework for targeted interventions. This knowledge can be used to develop evidence-based policies and

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design strategies that promote safe and accessible walking environments for all, particularly women, in cities around the world.

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transform
transport

Fondazione Transform Transport ETS (Leading Organization)

Type: Non-profit research Foundation

Country: Italy

Website: www.transformtransport.org

Transform Transport is a non-profit research Foundation based in Milan (Italy) focused on innovation in mobility and transport planning. It explores innovative, inclusive, and sustainable mobility solutions for shaping the future of society and cities worldwide.

It is grounded on 35 years of Systematica's expertise in the field, and explores how disruptive technologies, increasingly and rapidly influencing urban mobility, can have a positive impact on cities. This is done under the framework of a multi-disciplinary approach that looks at people, places and technologies in an integrated approach.

Transform Transport collaborates with public and private bodies and actively participates in academic partnerships to foster open dialogue and share knowledge and expertise with students. It also develops in-house research studies focused on its three main areas of research - urban mobility metrics, livable streets and inclusive mobility - disseminating them to urban actors, the scientific community and the open public through self-printed publications, peer-reviewed articles, conferences, workshops and speaking events.

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TeMALab
Department of Civil, Building and Environmental Engineering
University of Naples "Federico II"

TeMA Lab - Dipartimento di Ingegneria Civile, Edile e Ambientale dell'Università degli Studi di Napoli Federico II (Partner 2)

Type: Research Institution

Country: Italy

Website: https://www.temalab-unina.eu/

TeMA Lab, Laboratory of Territory, Mobility, a Certified Laboratory of the Ministry of Education and Research (code 213) is a research, higher education and scientific advice structure that operates in four fields of expertise each with its dedicated segment of the laboratory, equipped with specific technical and scientific skills and dedicated equipment.

Founded in 1224, the University of Naples Federico II is the oldest public non-sectarian university in the world. It was Europe's first university dedicated to training secular administrative staff, and one of the oldest academic institutions in continuous operation. The Department of Civil, Architectural and Environmental Engineering (DICEA) of the University of Napoli Federico II was established in 2013. The main objective of research and educational activities at DICES is to develop appropriate tools and train new generations of highly skilled engineers, technicians and researchers, and to promote technological innovation and processes in the fields of civil engineering.

Within the DICEA, the Urban and Territory Planning research unit (TeMA Lab) works both for education and for scientific research in the field of land use planning, urban mobility, urban competitiveness, transport/ land use interaction, real estate valuation and sustainable development. TeMALab has the primary task to study the relations between Territory, Mobility and Environment, in terms of scientific and discipline integration, that overcoming the barriers imposed by current scientific approaches can help to develop a new knowledge that can provide new solutions to the problems that cities are facing in these years.

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Sex and the City APS (Partner 3)

Type: Non-profit Association

Country: Italy

Website: https://sexandthecity.space/

Sex & the City is a social promotion association (APS), founded in 2022 by Florencia Andreola and Azzurra Muzzonigro, which observes cities from a gender perspective and does so through specific -both theoretical and practical- projects, public meetings and research projects. In this way, it tries to build a framework capable of integrating the gender dimension in the reflection on the city, so as to provide public administrations with useful tools to formulate policies that can organize spaces aiming at the well-being of everyone, female and male citizens.

In 2021 it published a research developed for Milano Urban Center on the city of Milan, *Milan Gender Atlas* (LetteraVentidue), a mapping on the condition of the city with regard to the daily life of women and gender minorities, and in 2024 *Free, not brave. Women and fear in public space* (LetteraVentidue), which focuses on the role of urban planning in addressing the issue of fear that women feel when crossing the city.

Sex & the City collaborates with public administrations to develop participatory projects and specific research initiatives capable of integrating the gender dimension into city planning and administration. Research activity on cities and gender is ongoing, along with an intense effort to disseminate these themes.

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Walk21 Foundation (Partner 4)

Acronym: W21

Type: Non-profit foundation

Country: UK

Website: https://walk21.com/

Walk21 is an international not-for-profit registered with the charity commission in the United Kingdom. Walk21 supports everyone's right to walk in a safe, inclusive and welcoming environment by providing evidence, tools, training and accreditation to a global network of concerned communities, politicians, academics and practitioners. Walk21 helps make cities more walkable to increase access to basic services; enhance road safety and public health; improve gender equality; and ensure accessible, equitable, sustainable transport systems.

Walk21 has supported European projects since 2000 as an innovator and convener; an expert advisor; a delivery coordinator of national campaigns and project investments in infrastructure; and as a communications and dissemination partner, capitalizing on their global network, annual international conference and regular newsletters and events.

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Terminology and acronyms

Acronym	Definition
FGD	Focus Group Discussion
GIS	Geographic Information Systems
GPT	Generative Pre-trained Transformer
GWR	Geographically Weighted Regression
ICTs	Information Communication Technologies
NIL	Nuclei d'Identità Locale (District level)
OLS	Ordinary Least Square
SDG	Sustainable Development Goal
SF_L1	Safety Factor - Level 1
SF_L2	Safety Factor - Level 2
S&tC	Sex & the City APS
TeMA	TeMA Lab - Department of Civil, Building, and Environmental Engineering, Università degli Studi di Napoli Federico II
TT	Fondazione Transform Transport ETS
UN	United Nations
W21	Walk21 Foundation
Women+	Women and gender minorities

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Acknowledgments

The scientific research project 'STEP UP – Walkability for Women in Milan[1]', submitted under the call for proposals "INEQUALITIES RESEARCH – Generating new knowledge to reduce inequalities" and awarded in 2022 by Fondazione Cariplo[2] (Grant No. 2022-1643), was focused on the level of walkability for women based on the perceived safety at night, in the city of Milan.

Transform Transport coordinated STEP UP from March 2023 to the end of February 2024 (12 months in total), in collaboration with TeMA Lab – Università degli Studi di Napoli Federico II, Sex and the City, and Walk21 Foundation. The collaborative efforts and support of these entities were key to the successful realization of this initiative.

We express our sincere appreciation to Fondazione Cariplo for their generous funding: the STEP UP project received a grant of around € 190,000. The Inequalities Research call for the year 2022 funded No. 15 scientific research projects, with a total budget of around € 2.5 million.

We thank all the people who generously contributed to the research, sharing personal information about their walking experiences through the Wher App, survey questionnaires and focus group discussions.

We wish to acknowledge the invaluable contributions of the Mobility Department and Urban Regeneration Department of the Municipality of Milan for providing essential proprietary data that significantly enhanced the project outcomes.

Our gratitude extends to Modality[3] for their pivotal role in the development of an Interactive Web GIS, facilitating the visualization of the project's findings. We also extend our thanks to Amina Salama[4] for her work on the design of the project booklet, encapsulating its essence with creativity and precision.

We also thank Zayneb Kadiri (Communication Manager at Transform Transport), Caroline Purps (Content Editor at Transform Transport), Elisabetta Castellari (Press Office at SETTE LUCI), and Manuelita Maggio (Press Office at SETTE LUCI) for their

[1] See: https://transformtransport.org/research/inclusive-mobility/step-up/

[2] See: https://www.fondazionecariplo.it/

[3] See: https://with-modality.com/en/

[4] See: https://aminasalama.myportfolio.com/data-visualisation

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fruitful contribution in promoting and disseminating the results of STEP UP, and Tatiana Negurita (Grant Manager at Transform Transport) for her support in managing the funding of Fondazione Cariplo and the reporting procedure.

We express our gratitude to the participants of the final event of STEP UP[5], which was held at BASE Milano on February 16, 2024 (over 100 people participated in the event). The event was aimed at presenting the project and the STEP UP Booklet[6] which provides insights gained from the research process and recommendations for future initiatives in gender-inclusive urban planning.

The event also comprised a series of insightful talks and discussions centering on the findings of STEP UP and shedding light on the broader scope of gender-inclusive mobility planning in Milan and beyond, offering audience members the opportunity to delve into the diverse findings of the project and engage in fruitful discussions with esteemed guest speakers. Thus, we want to thank the speakers who participated in the event (listed below in alphabetical order):

- Donatella Bollani - Architect and Editor specializing in environmental issues;
- Laura Galluzzo - Department of Design, Politecnico di Milano;
- Marco Granelli - Security Councillor, Municipality of Milan;
- Linda Gustafsson - Gender Equality Officer at the Municipality of Umeå, Sweden;
- Elena Lattuada - Mayor's Delegate for Gender Equal Opportunity, Municipality of Milan;
- Nogaye Ndiaye - Human rights advocate;
- Giorgia Ziliani - Dare NGO, Her City Project in Corvetto.

We thank all the organizations which supported the STEP UP project proposal with a Letter of Interest and participated in the dissemination activities (listed below in alphabetical order):

- Dr. Federica Biassoni - Traffic Psychology Research Unit - Università Cattolica del Sacro Cuore;

[5] See: https://transformtransport.org/media/events/step-up-final-event/

[6] See: https://issuu.com/systematica/docs/step_up_walkability_for_women_in_milan

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- Dr. Luisa Bravo - Founder, President of City Space Architecture;
- Arianna Censi - Deputy Mayor for Mobility, Municipality of Milan;
- Prof. Ferdinando Fornara - Director of CIRPA-Centro Interuniversitario di Ricerca in Psicologia Ambientale, Sapienza Università di Roma;
- Prof. Barbara Piga - Laboratorio di Simulazione Urbana Fausto Curti, Department of Architecture and Urban Studies, Politecnico di Milano;
- Arch. Valentino Sevino - Director General, AMAT-Agenzia Ambiente e Territorio;
- Arch. Giancarlo Tancredi - Deputy Mayor for Urban Regeneration, Municipality of Milan.

Eventually, we are grateful to the Editorial Office of FedOA Press and to the reviewers who generously donated their time and expertise. Their insightful comments and suggestions significantly strengthened the accuracy and clarity of the content. This book would not be the valuable resource it is today without their invaluable contribution. During the preparation of this work the authors used Scite.ai[7] as a proofreading tool. After using this tool/service, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.

The collected and analyzed data was treated according to the GDPR-General Data Protection Regulation (EU, 2016/679). We dedicate this publication to the women and gender minorities of the city of Milan who know too well the challenges of walking in the city at different times of day, with a focus on nighttime. We hope that this research will give visibility and shape to your experiences, and will support decision-makers towards a more equitable city.

stepup

The STEP UP team

[7] See: https://scite.ai/

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Disclaimer

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Additional Resources

- STEP UP project webpage: https://transformtransport.org/research/inclusive-mobility/step-up/
- STEP UP Safety Index Map: https://app.transformtransport.org/stepup/safety-index.html
- STEP UP Interactive WebGIS: https://stepup-viz.transformtransport.org/
- STEP UP Booklet: https://issuu.com/systematica/docs/step_up_walkability_for_women_in_milan
- STEP UP Final Event: https://transformtransport.org/media/events/step-up-final-event/

Parts of the research have been published in the following scientific Journals:

Scarponi, L., Abdelfattah, L., Gorrini, A., Valenzuela Cortés, C., Carpentieri, G., Guida, C., Zucaro, F., Andreola, F., Muzzonigro, A., Da Re, L., Gargiulo, E., Cañas, C., Walker, J. & Choubassi, R. (2023). Thematic review on women's perception of safety while walking in public space: the STEP UP project. *Sustainability*, 15(21), 15636. https://doi.org/10.3390/su152115636

Abdelfattah, L., Scarponi, L., Messa, F., Guida, C., Zucaro, F., Carpentieri, G., Andreola, F., Muzzonigro, A., Walker, J. and Gorrini, A. (2024). A Digital Humanities Approach to Study Women's Perceptions of Safety in the City of Milan: The STEP UP Project. In: Gervasi, O., Murgante, B., Garau, C., Taniar, D., C. Rocha, A.M.A., Faginas Lago, M.N. (eds) *Computational Science and Its Applications – ICCSA 2024 Workshops. ICCSA 2024.* Lecture Notes in Computer Science, vol 14823. Springer, Cham. https://doi.org/10.1007/978-3-031-65329-2_4

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CHAPTER 1

The STEP UP project

1.1 Introduction

Advanced urban and transport planning activities are shifting towards sustainable urban mobility solutions, with a focus on walkability (Speck, 2013; Buhrmann et al., 2019; Moreno et al., 2021), namely referring to how friendly the urban environment is for walking in terms of proximity service availability (i.e., *15-min city*), street connectivity, comfort of public spaces, and road safety.

Within a short timeframe and following the impact of the Covid-19 pandemic, city administrations have adopted short and long-term plans to redistribute vehicular road space towards cyclist and pedestrian infrastructures (European Platform on Sustainable Urban Mobility Plans, 2020; Transform Transport, 2022).

Although traditional approaches tend to focus on the spatial dimension (Wang and Yang, 2019), individual characteristics of city users are found to have a significant impact on the perceived level of walkability (e.g., demographics, travel purposes, mobility preferences, etc.). In particular, the measures currently in place tend to consider a standardized population group, a method which has been acknowledged to discriminate against specific demographic and social categories (i.e., *SDG 11.2-Sustainable Transport for All*) (United Nations, 2016), including women.

According to the contributions of Manaugh and El-Geneidy (2011), Speck (2013), and Rani et al. (2022), and thanks to previous works already performed by the members of the STEP UP team (Guida and Gaglioni, 2020; Andreola and Muzzonigro, 2021; Gargiulo et al., 2021; Gorrini et al., 2021), the assessment of the level walkability for women in urban environments can be defined through the following general criteria: *(i)* accessibility to proximity services within a comfortable walking distance or usefulness; *(ii)* comfort of urban spaces in terms of streets, sidewalks, public space, and green areas; *(iii)* perceived level of safety while walking, in terms of road safety and personal safety; *(iv)* vitality of the social context and attractiveness of the streetscape. These criteria were further elaborated through the STEP UP project in order to take into account gender-based dynamics such as mobility patterns or social roles that influence individual behavior in urban space and walkability assessment.

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More in detail, Lecompte and Pablo (2017), Pollard and Wagnild (2017), Golan et al. (2019), Andersdotter Fabre et al. (2021), and Sethi and Velez-Duque (2021) highlighted that women experience the city differently than men, in part because they are more concerned with safety issues related to aggression and harassment. These constraints take the form of precautionary or avoidance behaviors due to fear of violence, perception of risk, and sense of vulnerability, as a major inhibitor of mobility for women in public spaces especially at nighttime (Loukaitou-Sideris, 2014; Koskela, 1999; Pain, 2000; Vera-Grey, 2018; Whitzman, 2013).

An initial literature review also led to the conclusion that, within the issue of walkability from a gender perspective, safety and perceived level of safety are most influential. Golan et al. (2019) and Loukaitou-Sideris (2014) described women's experience of the city as concerned and inhibited by the risk of physical and verbal aggression. This set the premises for more vertically focused research on the perception of safety of women walking alone in public space.

Safety isn't of course the only factor influencing walkability for women, however as previously stated, it is the strongest distinguishing factor between walkability for women and walkability in general (Golan, 2019). The intention isn't to marginalize the walkability of women to the concept of women's safety, it is to listen to what has been collected so far from women's voices and participation, highlight it in the context of the city of Milan (Italy), and trace it back to the practice of walkability and livability of urban public space.

During the process of the data collection, it was evident that to dig deeper in the aspects of safety perception, it would be necessary to further narrow the research to a certain extent of time per day. The nighttime was deemed the most relevant, given the data from the Wher App and the fact that it is more heavily influenced by fear of crime (Koskela, 1999).

In this framework, the research project 'STEP UP - Walkability for Women in Milan' focuses on the urban experience of women walking alone at night in the city of Milan. STEP UP was submitted under the call for proposals 'INEQUALITIES RESEARCH – Generating new knowledge to reduce inequalities' and awarded by Fondazione Cariplo (Grant No. 2022-1643). The project was coordinated by Transform Transport

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from March 2023 to the end of February 2024, in collaboration with TeMA Lab – Università degli Studi di Napoli Federico II, Sex and the City, and Walk21 Foundation. As a first step, a thematic literature review was conducted on the most recent and relevant scientific contributions, and policy guidelines about this topic (see Chapter 2 - Use Cases Definition). At an early stage of the project, the focus of the review shifted from analyzing walkability as a whole to analyzing perception of safety while walking, through a gendered lens.

The results of the literature review were then exploited to collect different kinds of data (see Chapter 3 - Data Collection). A series of existing relevant geolocated datasets were retrieved, sorted, and filtered from open data repositories and geoportals. New data on the relation between specific urban elements and perceived safety at night in Milan was retrieved through an online survey and focus groups. Data regarding the perceived level of security of women while walking was collected through the Wher App. Wher is a crowd-sourced mapping tool operated by Walk21 allowing women in a particular city to rank geo-referenced locations according to their perceived level of security while walking. Since 2019, the Wher App has been active in multiple cities across Italy, including Milan. All these gender-disaggregated data sets were analyzed through GIS-Geographic Information Systems to design a multi-layer map of Milan focused on the perceived level of safety of women at night and in relation to urban elements (see Chapter 4 - Data Analysis and Mapping).

The results of the project helped to identify challenging areas or neighborhoods in the city of Milan which can serve as samples of analysis to develop a set of policy recommendations aimed at enhancing the level of walkability for women in cities. In particular, the collected disaggregated data was used to support the definition of guidelines and policies for the design of future public spaces, focusing on the impact of individual characteristics of pedestrians in relation to their gender, on the perceived level of walkability.

1.2 Objectives

The STEP UP project stands within an international and European context, the EU urbanization trend requires institutions to design and plan cities more effectively to

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improve the quality of life of the inhabitants. In this context, an essential element of new development agendas for future cities is based on the need to adopt and advance sustainable mobility strategies. Such policies need to focus on making mobility affordable, accessible, and consistently available by enhancing walking, cycling and public transport services while reducing the impact of vehicular traffic (e.g., speed, volumes, air quality, parking, etc).

Within the international context, the Sustainable Development Goals (SDGs) proposed by the United Nations in 2015 provide a blueprint to achieve a more sustainable future for all. There are several targets directly linked with investing in more walking as a travel mode in its own right and walking as a first-and-last-mile solution to connect to public transport, most notably, SDG 11.2-Sustainable Transport for All, which states: "*By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons*". Other direct impacts include SDG 5-Gender Inequalities and SDG 10-Reduced Inequalities.

Figure 1-1 The UN's SDGs related to the STEP UP project

The objective of STEP UP was twofold: (i) to conduct a socio-spatial analysis using data-driven techniques on the conditions of safety and walkability from a gender-based perspective; and (ii) to propose actionable recommendations to city authorities based on measurable quantitative and qualitative outputs of the research conducted on the case of the city of Milan. The objectives of the project aimed to fill the following gaps in research and practice:

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- *Literature gaps*: despite robust research on walkability and cities and a growing volume of research on gender implications on urban mobility, there was a lack of knowledge at the intersection between walkability and gender that requires further investment both on the part of qualitative and quantitative analysis;
- *Data gaps*: in the light of the poor availability of open-source data concerning the security perception of users in urban environments, the project aimed to promote a replicable and scalable best practice by applying GIS-based methodology, location-based open data, and user-collected data to support policymakers. The suggestions and reports of the Wher App users represented a reliable and as yet unexplored database for investigating which urban and spatial characteristics affect women's perceived security and, hence, turned this knowledge into take-aways for more inclusive cities;
- *Research methods*: the objectives of the STEP UP project was to show how the recent development of advanced ICTs-Information Communication Technologies and the increasing availability of digitally widespread data sources can provide innovative assessment tools and metrics to support an effective planning of mobility services, within an evidenced-based and multi-disciplinary approach. The project also responded to the need to bridge academic research regarding equity and inclusion in transportation with the activity of practitioners and decision makers;
- *Policy guidelines*: it is important to note that the reliance on a specific coherent political/ feminist approach in designing the framework of the project was crucial in two ways. First, it aligned and explicated the intended ideological path of the research group in carrying out all phases of the project. Moreover, it provided a normative guideline for future research to follow when addressing social issues in urban planning that are built on normative questions as well as objective data.

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1.3 Methodology

An essential element of new sustainable development agendas is the need to encourage city managers to adopt a multi-disciplinary approach and an integrated methodology. The plan and design of future urban settlements requires the integration of different knowledge and skills, ranging from engineering and architecture to social science and computer science. It is necessary to consider the needs and expectations of the citizens to properly design both built environments and services.

In particular, the explosion of location-based data and data collection tools in recent decades has led to a paradigm shift for urban and mobility planning. For the first time, movement patterns happening all around the city could be gathered passively at a large scale and synthesized in ways that give us insight about changes in mobility behavior in real-time. Not only that, but the ubiquity of geo-referenced data (in large part owing to digital miniaturization) has led to the decentralization of data collection to billions of data sharers, significantly broadening the type and depth of movement data we can collect; a phenomenon we refer to as 'data in every pocket' (Choubassi and Abdelfattah, 2020). Simply put, Big Data (and in particular location-based data) is transforming how we document, collect and understand mobility patterns.

The discipline through which urban planners employ these technology-enabled spatial analysis methods has come to be known as Urban Informatics (Foth et al., 2011). Urban Informatics is an evidenced-based approach that, thanks to the recent development of advanced ICTs and the increasing availability of digitally widespread data sources, has led to innovative assessment tools and metrics that can provide valuable support to city decision makers. Due to unprecedented data volumes, granularity and diversity, problems of sampling bias associated with traditional data collection methods can be sufficiently overcome, allowing the data to be manipulated to focus on specific communities, their behaviors and needs (Batty, 2013; Milne and Watling, 2019).

In this framework, STEP UP proposed a multi-disciplinary methodological approach to promote a user centric design of mobility culture in the city of Milan, based on the

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integration of the different disciplines and approaches. This was aimed at assessing the level of accessibility of the cities focusing on walkability considering the perceived quality of the urban environments in terms of the perceived level of safety. STEP UP integrated both objective standard measures and subjective evaluations to achieve a comprehensive recommendation tool for supporting city managers, designers and policy makers. In particular, the methodological approach of STEP UP had the following objectives:

- Understand the city users' needs and expectations regarding the services and infrastructure of a city with reference to pedestrian mobility and walkability;
- In-depth data analysis to transform data from knowledge into evidence on current and future urban mobility walking trends;
- Provide useful insights to support city planners in the design of more sustainable urban environments by means of innovative mobility guidelines based on an evidence-based approach.

The methodological components of the project STEP UP employed a wide range of methodologies and data collection techniques to empirically measure the level of walkability of the city of Milan. The methodological approach of STEP UP comprised the following indicators:

- *Structural indicators*: related to road infrastructure and connectivity (e.g., accessibility of the road infrastructure, quality of service provisions, demographics of the inhabitants, etc.);
- *Behavioral indicators*: related to how the spatial features of the area influence the activity of people walking (e.g., Wher App data based on spatial data, etc.);
- *Subjective indicators*: focused on the evaluation of pedestrians concerning the level of walkability of the area (i.e., *perceived safety*).

The methodological approach of STEP UP had the objective to transform data from knowledge into evidence on current and future urban mobility walking trends based on evolving city characteristics (e.g., mobility patterns, density, demographics, land use, etc.) and it comprised three main methodologies:

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- *GIS-based analysis*: GIS was applied to produce spatial analysis and thematic maps based on geo-referenced data regarding the topographic, infrastructural and architectural elements of the city (e.g., accessibility of public transport, proximity services, health care, schools, places of work and green space as well as road safety data, etc). This was aimed at characterizing different areas of the city for walking in relation to the perception of safety;
- *Smartphone App data analysis*: expanding on the existing Wher App, which has already been trailed and has successfully engaged communities to share their opinions on walkability, STEP UP collected both qualitative data regarding the perceived level of safety and spatial data related to the mobility behaviors of different categories of users. This allowed us to create three dimensional walking maps that capture knowledge on community activity, city environments and the areas of perceived concern. Results of the smartphone application data analysis supported mapping analysis of the security pillar of walkability with a robust set of historical location-based data as contributed by real female users of the city of Milan;
- *Questionnaires and focus groups*: survey questionnaires and interactive focus groups allowed walkability to be assessed by end users/ stakeholders following a gender-sensitive intersectional approach for data collection. Results strengthened thematic literature, providing a baseline for setting factorial weights in GIS-based analysis of the city of Milan.

1.4 Work Plan and Work Packages

The work plan of the STEP UP project was based on a composite methodology which comprises interrelated Work Packages and Tasks. Each of the three central chapters of this document (Chapter 2, Chapter 3, Chapter 4) encompasses the methodology and results of the three main Work Packages (WP2, WP3, WP4) respectively.

Within the WP2 Use Case Definition, a preliminary thematic literature review was conducted on the most relevant scientific contributions (Task 2.1), but also case studies and policy guidelines (Task 2.2). WP3 Data Collection was aimed at collecting

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a series of relevant dataset for the project, focusing on location-based open data (Task 3.1), Wher App data (Task 3.2), survey questionnaires and focus groups (Task 3.3). WP4 Data Analysis and Outputs Evaluation was aimed at identifying challenging areas or neighborhoods in the city of Milan which served as samples of analysis to help develop a set of policy recommendations or physical intervention actions aimed at enhancing the level of walkability for women in the city. Activities included: GIS analysis and mapping (Task 4.1) and policy and design guidelines (Task 4.2). WP1 Management and Coordination and WP5 Dissemination lasted for the entire duration of the project.

More in details, the project was divided into four phases (see Figure 1-1): an initial literature review confirming the key role of safety and perception of safety in gender walkability; the collection of relevant data through differentiated methods (e.g., app, geo-localized data, online survey questionnaires, focus groups, etc.), and the analysis of such data as a benchmark for the development of design guidelines for public space, in order to support local decision-makers in the urban planning process.

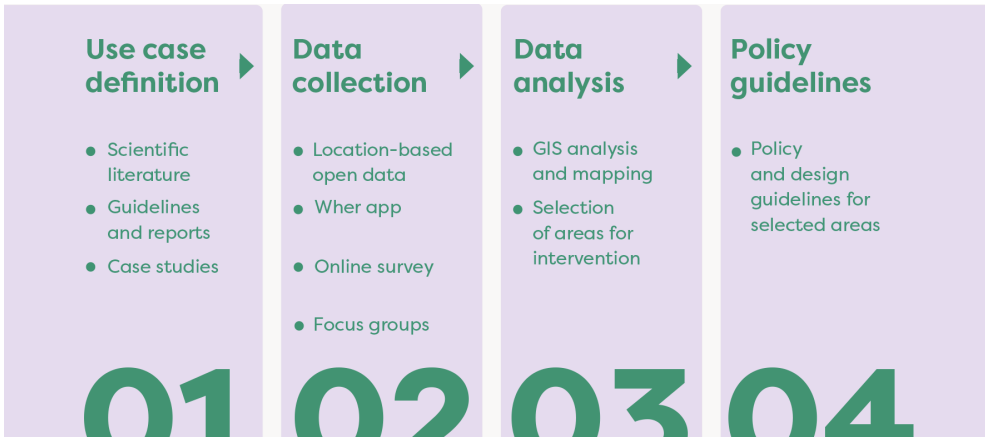

Figure 1-2 STEP UP methodology (graphics by Amina Salama)

Conducting a structured literature review in the first phase of the research project STEP UP was crucial for defining the most relevant topics related to the perception of safety for women walking (i.e., *Safety Factor_Level 1, Safety Factor_Level 2*) and for guiding the collection and analysis of data in the subsequent phases of the project.

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Through the literature review process, 19 relevant safety factors were identified relating to 3 broad types of data: urban characteristics of public spaces in the city (i.e., *spatial data*), social behaviors and neighborhood conditions (i.e., *city use*) and specific land uses or destinations that are associated with feelings of safety or lack thereof (i.e., *hotspots*).

These safety factors were used to select a series of relevant geolocated datasets, where available, which were retrieved, sorted, and filtered from open data repositories, geoportals, and census databases (WP3 Data Collection - Task 3.1 Location Based Open Data). In the lack of data on specific safety factors, proxy indicators were used and explicitly stated when deemed relevant to the aims of the analysis.

A focus on the intersectional approach - whether in the literature review or document analysis - highlighted the fact that intersectional inequality tends to be addressed qualitatively due to a lack of sufficient data. The review of data collection methods in Subsection 2.3, and in particular for studies relying on online safety reporting/ mapping tools for data collection, revealed a challenge in relying on existing datasets in pre-existing reporting platforms (such as Wher App), which are the least flexible to tailor for the aims of new research.

At the same time, this method, which is one of the core data gathering methods of STEP UP, is more robust in terms of the size, geographic distribution and longevity of the data, in comparison to a limited data sample collected within the duration of the project. It also has the potential to provide more reliable data due to in-situ reporting at the time of the incidence of a certain safety event as opposed to ex-post reporting, which may be inaccurate due to unreliable memory in incident recollection. These issues were addressed in the design of the survey in WP3 Data Collection - Task 3.3 Survey, Questionnaire and Focus Groups, whereby an extensive demographic section aims to collect as much relevant information on intersecting inequality dimensions as identified in Subsection 2.1 to broaden the database from which to analyze relevant intersectional biases, in order to compensate for data limits in the Wher App data sample. Specific attention was given to ensure representative samples of data for marginalized and underrepresented communities.

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With regard to WP4, the definition of each Safety Factor achieved in WP2 didn't always correspond to a specific existing dataset, in which case the dataset was analyzed within the WP4 Data Analysis and Outputs Evaluation - Task 4.1 GIS analysis and Mapping in order to be representative of the Safety Factor in question. Moreover, key insights from Task 2.2 'Case studies and Policy Benchmarking' present in WP2 and discussed herein informed the development of the WP4 Data Analysis and Outputs Evaluation - Task 4.2 Policy and Design Guidelines mainly through comparison of policy guidelines and good practices in various contexts to extract relevant guidelines for intervention measures suitable for the identified intervention areas.

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CHAPTER 2

Use cases definition

2.1 Introduction

The Chapter 'Use Cases Definition' focuses on the second Work Package of the project, aimed at providing a thorough overview on the current scientific research, policies and reports on the topic, and of existing case studies, with particular reference to the Task 2.1 'Thematic Literature Review' and Task 2.2 'Case Studies and Policy Benchmarking'.

The analysis encompassed a comprehensive examination comprising a scientific literature review focusing on the most recent and relevant scientific publications related to the subject, an assessment of international reports (including country-specific reports and project reports from global organizations specializing in gender aspects of urban planning and transportation), and a scrutiny of essential urban design and policy directives aimed at mitigating gender disparities in urban settings. This integrated approach facilitated a holistic understanding of the topic, bridging insights from scientific research to practical tools and guidelines essential for formulating an intervention strategy for the research on the city of Milan. Furthermore, the review extracted specific case studies from the literature to showcase exemplary practices and global initiatives dedicated to enhancing pedestrian safety for women across diverse urban landscapes.

With reference to the WP2, STEP UP aimed to fill the following gaps in research and practice:

- Literature gaps: despite robust research on walkability and cities and a growing volume of research on gender implications on urban mobility, there was a lack of knowledge at the intersection between walkability and gender that requires further investment both on the part of qualitative and quantitative analysis;
- Research questions: what are the need and barriers experienced by women and gender minorities while walking in public urban spaces in the city of Milan? How do different intersectional profiles impact these experiences? What are the physical aspects of the city that we can change to make the experience of the city better for women and gender minorities?

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2.1.1 Inclusive and Safe Cities

The project centered around the vision of inclusive and safe cities, which represents a fundamental paradigm in contemporary urban design, aiming to create spaces that meet the needs of the entire population, promoting accessibility, equity, and a sense of belonging. Inclusivity, in this context, refers to the design of urban environments that are welcoming to all citizens, regardless of their individual characteristics.

The design of inclusive cities involves a significant commitment to removing physical and economic barriers. This means ensuring that urban spaces are accessible to people with physical disabilities but goes beyond, considering economic, cultural, and social accessibility. This includes creating accessible pedestrian paths and establishing public services that cater to everyone, irrespective of age, gender, or socio-economic background. Security is a fundamental element in every individual's urban experience. In an inclusive city context, security encompasses not only the presence of law enforcement or surveillance systems but also the perception of safety by citizens.

This perception is strongly influenced by the design of public spaces, lighting, the presence of green areas, and opportunities for social interaction. Inclusive cities recognize and address gender and cultural disparities in society. Urban design should consider the specific needs of women and individuals from diverse cultural communities. This may involve creating safe and welcoming spaces and adopting policies that promote gender equality and cultural diversity.

A key element in achieving inclusive cities is active community participation in the decision-making process. Involving residents in urban planning and design ensures that proposed solutions respond to the real needs of the population. This bottom-up approach fosters a sense of belonging and responsibility within the community. In conclusion, the creation of inclusive and safe cities requires a holistic approach that considers the diversity of the population, promotes universal accessibility, and encourages active community participation. Only through ongoing commitment to equity and inclusivity can cities truly reflect the needs and aspirations of those who inhabit them.

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2.1.2 Intersectional approach

The STEP UP project aims to have an intersectional approach to the subjects of walkability and gender. Intersectionality is a term coined by Kimberlé Crenshaw and more recently defined as a prism for seeing the way in which various forms of inequality often operate together and exacerbate each other (Crenshaw, 2020). According to this definition, an intersectional approach aims to tackle the complex system of multiple spheres of inequalities as a whole. This conceptual framing seeks to recognize the overlapping of interconnected experiences of oppression and privilege and acts as a theoretical and comprehensive framework for power dynamics such as racism, sexism, classism, heterosexism, transphobia, xenophobia and ableism (Davis, 1983; Crenshaw, 1989).

The focus on intersectionality has gained recognition in EU political agendas. The European Charter for Inequality provides a guide for regional and local governments breaking down intersectionality into a practical approach that can be tailored to local needs and integrated in local equality policies (Dennehy et al., 2022). An intersectional perspective is also included in the European Commission's 2020-2025 Gender Equality Strategy and constitutes one of its six pillars (European Commission, 2020). The Strategy sets out key actions and provides a framework for an equality perspective to be applied in all EU policy areas.

The drive towards equality in public spaces must start by acknowledging the standard default through which cities have been designed up to this day, a default which is male, white and abled (Perez, 2019). This entails that urban environments are not neutral and, consequently, equal exposure to the same space has different effects on various individuals. Within this context the concept of fairness can't be limited to equal treatment, it must encompass and acknowledge the multitude of co-existences and layers of discrimination (Hail and McQuaid, 2021).

A conception of gender that views it as one element in a multi-layered fabric of discrimination that makes up our society can offer a more comprehensive understanding of human experience in the urban environment (Koskela, 1999). STEP UP aimed to use a gendered lens through which to observe the urban space of the city and the practice of walking and walkability. Through multiple sources of gender-

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disaggregated data (e.g., Wher App, location-based data, survey questionnaire, and focus groups, etc.), STEP UP seeked to provide an intersectional framework of attributes for an all-round inclusive city, in the case study of Milan. Given the predating condition of Wher App data, intersectional analysis is limited to the demographic data collected at the time of use. To partially compensate for this limitation, the survey questionnaires and focus groups are designed with a wider range of identity dimensions in mind.

For the sake of clarity, by defining the term women within the research it is possible to provide an accurate framework which allows the replicability of the findings and ensures the validity and reliability of the project (Butler and Gleeson, 2021). Women refers to individuals who identify as women, within the knowledge that women's experiences and challenges are diverse and shaped by multiple dimensions of identity, and that they may face different forms of discrimination and inequality based on the intersection of these identities (e.g., age, ethnicity, socioeconomic status, sexual orientation, gender identity, disability, etc.). The definition of women is therefore inclusive of those who are trans, gender fluid, non-binary, or prefer to self-describe.

2.1.3 Walkability and Women's Perception of Safety

The theme of walkability is strongly linked to the current shift towards sustainable mobility, particularly in urban environments, and is also related to health benefits given by increased levels of physical activity. The attention towards walkability started in 1988, with the European Charter of Pedestrian Rights issued by the European Parliament, focusing on the need to ensure comfort and safety for pedestrians in urban areas. The General Theory of Walkability proposed by Speck (2013) explains the essential elements for evaluating the level of walkability of urban environments and in 2006 Walk21 Foundation created the International Charter for Walking, identifying 8 principles and 32 indicative actions for cities to improve walkability. Following consultation with 25 countries, Walk21 Foundation published the first Global Set of Walking Indicators (see Figure 2-1) identifying 36 key factors

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that can be measured to explain the extent of support and level of reasonableness that is asked of pedestrians.

Figure 2-1 Global Set of Walking Indicators defined by Walk21 Foundation

Walkability is influenced by spatial dimensions and by individual characteristics of city users, which significantly determine the perceived level of pedestrian friendliness of streets and public spaces. When referring to walkability for women we address the complex experience of walkability related to identifying oneself as a woman.

As highlighted by Golan et al. (2019), Andersotter Fabre et al. (2021), and Sethi and Velez-Duque (2021), women experience the city differently than men, due to factors such as concern with security issues related to aggression and harassment, this leads to a major inhibition of mobility for women in public spaces especially at nighttime. This isn't to say the only distinguishing factor between walkability and walkability for women is the factor of safety and security, but until now it's the factor that has been most influential (Golan et al., 2019).

Research on walkability related to gender has either focused primarily on the factor of safety and security (Vitrano et al., 2018) or it has considered safety within a series of relevant factors such as comfort, usefulness, attractiveness (Gorrini et al., 2021), or it hasn't considered safety at all, simply providing data on different walking habits between men and women (Goel et al., 2021).

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Safety is defined as a state in which or a place where you are safe and not in danger or at risk, when referring to safety in an urban environment this can take on different meanings. Security, on the other hand, is defined as the protection of a person, building, organization, or country against threats such as crime or attacks by foreign countries. The terms safety and security are related and can sometimes be used interchangeably, however they have two distinct meanings. The concept of safety refers to the condition of being protected from harm, danger or risk; it involves measures and precautions taken to prevent accidents, injuries, and potential hazards to ensure physical well-being. Security, on the other hand, goes beyond physical well-being and encompasses a broader range of concerns, it refers to the state of being protected against various threats, such as unauthorized access, theft, damage, or any malicious intent. Safety focuses on ensuring the well-being and physical integrity of individuals, communities, or objects, security is not only related to personal safety but also to safeguarding assets, data, information, or even national interests. This research addresses the concept and the perception of safety.

However, it's important to recognize that safety isn't solely determined by tangible elements, it's also influenced by the perception of safety and vice versa: safety and perception of safety are intertwined and mutually influential. Understanding the relationship between safety and perception of safety is crucial for the in-depth comprehension of the issue of safety for women who walk in the city.

The perception of safety is shaped by the assessment that the subject makes of the physical environment, it is influenced by the spatial conformation of the environment, for example the prospect refuge theory analyzes geometrical characteristics of the space and how these change the feeling of vulnerability (Fisher & Nasar, 1992). Another influence is the perception of the use of space: the Broken window Theory states that a heightened perception of disorder and neglect increases fear of crime (Wilson & Kelling, 1983).

People's perception of safety is also shaped by their personal experiences and personal background, influenced by social interactions, cultural factors and individual characteristics. Perception of safety is in fact directly linked to one's social identity and the many layers that form it (e.g., age, gender, status, etc.). Therefore whenever

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the subject of safety is addressed through the dichotomisation of victims-offenders, feared-fearful, the lack of recognition that these concepts change depending on the perspective from which they are viewed results in a bias (Pain, 2001).

The main emotional response to perception of safety is fear of crime, which Pain (2001, p. 901) defines as "*the wide range of emotional and practical responses to crime and disorder made by individuals and communities*". This response has been translated in "geographies of fear" (Valentine, 1989) encompassing a multitude of identities, which have a complex way of mobilizing fear and are equally complex to understand (England & Simon, 2010). Just as the gendered lens provides a different way of perceiving walkability, it also produces a different way of perceiving safety in the city. Women's perception of safety in the public space has been subject of many researches (Koskela, 1999; Pain, 2001; Loukaitou-Sideris, 2014), it has gained particular attention following the tragic events of the murders of Sarah Everard and many others in the UK during the pandemic.

2.2 Thematic Literature Review

Task 2.1 'Thematic Literature Review' refers to the review of existing literature focused on identifying pertinent issues and challenges regarding women's mobility experience as pedestrians. Literature review was conducted through several academic databases (e.g., Web of Science[8], Scopus[9], Google Scholar[10], ResearchGate[11], etc.) focusing on the most recent and relevant scientific contributions about this topic, which have been organized in a tabular structure. This contains a list of twenty-three scientific references which were selected through keywords (i.e., *gender*, *safety*, *walkability*). The papers date from 1999 to 2022 and encompass a balanced distribution over said timeline with a close up on the period

[8] See: https://clarivate.com/products/scientific-and-academic-research/research-discovery-and-workflow-solutions/webofscience-platform/

[9] See: https://www.scopus.com/home.uri

[10] See: https://scholar.google.com/

[11] See: https://www.researchgate.net/

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between 2015 and the most recent contributions, which take up over half of the literature review.

The titles and abstracts of every paper from the proposed thematic literature review were correlated through VOSviewer[12] (see Figure 2-2) where it is possible to see which keywords were repeated most and how they are related within the timeframe. Each circle represents a term and its dimensions correspond to the number of times the term was used in the paper's titles and abstracts, in this case only terms that occurred a minimum of 6 times were selected. The keywords that emerged are: city, crime, fear, gender, perception, public space, safety, space, woman. The words are clustered based on how they are related in the titles and abstracts, and the links between them vary based on the number of connections.

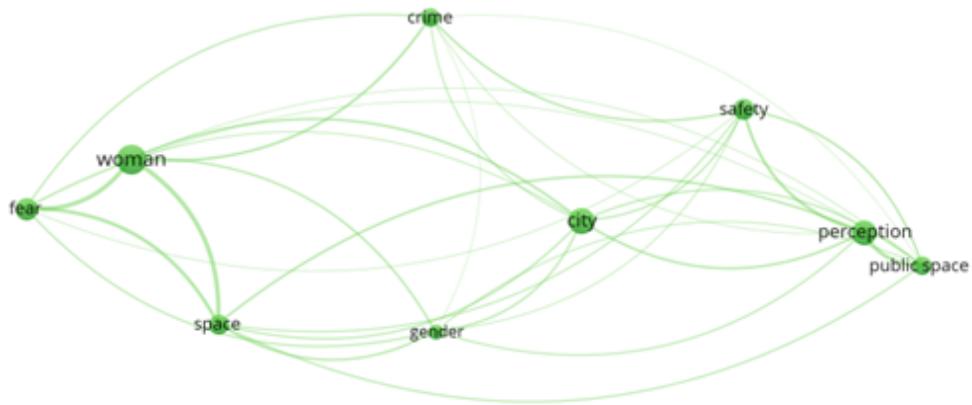

Figure 2-2 VOSviewer correlation analysis of the proposed literature review

The selected bibliographic database was then reviewed and the summary of the finding organized by: (*i*) bibliographic information (Author, Year; reference); (*ii*) gender approach (none, binary, non-binary); (*iii*) timeframe (undefined, daytime, night); (*iv*) Safety Factors (i.e., *SFs_L1*, *SFs_L2*); (*v*) methodological approach (i.e., GIS, GPS data, App data, questionnaires, focus groups); and (*vi*) key findings from each reference. The process allowed the identification of three main Safety Factors - Level 1 related to safety for women walking (see Figure 2-3, Annex I and Annex II):

[12] VOSviewer version 1.6.19 is an open source software tool for constructing and visualizing bibliometric networks, see: https://www.vosviewer.com/

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(*i*) *Spatial Features* (space characteristics/ morphological features); (*ii*) *City Use* (traces of behavior and presence of other city users); and (*iii*) *Hotspots* (safe havens and no-go areas). A further development of this classification resulted in nineteen sub-factors or Safety Factors - Level 2 (SFs_L2), of positive or negative connotation. The SF_L1 and SF_L2 were then verified through a workshop organized by the STEP UP team on the 8th of June 2023 in Milan. The workshop had a duration of over two hours and involved the participation of around ten participants, who reviewed the safety factors through the completion of the survey (WP3 Data Collection) aimed at understanding the influence of each safety factor on people's perception of safety. In this context, the SF_L2 Sex work factor was added and the concept of the SF_L2 Presence of people was further explored.

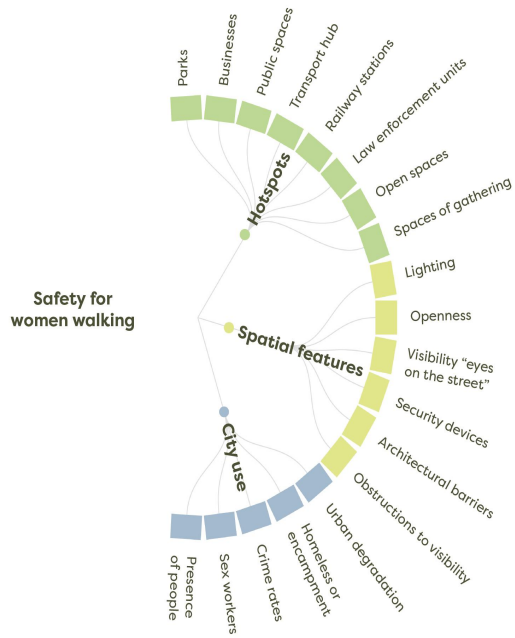

Figure 2-3 Safety for women walking factors SF_L1 and SF_L2 (graphics by Amina Salama)

2.2.1 Spatial Features

The SF_L1 'Spatial Features', namely the spatial form alone, is focused on the characteristics/ morphological features of the urban environments which influence

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the perspective of safety for women while walking (e.g., physical features, urban furniture, etc.). The perception of space varies on parameters that range from geometry and sheer volumes to the detail of urban design (Rossetti et al., 2019). In this context, the identified Safety Factors - Level 2 include the following:

- SF_L2 Lighting: presence, maintenance and features of lighting systems;
- SF_L2 Openness: ability to see and move in all directions;
- SF_L2 Visibility "eyes on the street": possibility to be seen from shops, vendors and buildings;
- SF_L2 Obstructions to visibility: presence of greenery and other elements as an obstacle and supplying hiding places;
- SF_L2 Architectural Barriers: physical impediments to free/ direct movements;
- SF_L2 Security devices - presence of emergency buttons and/or surveillance systems.

SF_L2 Lighting

The design of streets and public spaces should include the presence and maintenance of adequate lighting systems to guarantee the perception of safety while walking (Ceccato et al., 2022; England & Simon, 2010; Gorrini et al., 2021; Koskela, 1999; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Pain, 2000; Uteng, 2019; Uteng, 2021; Whitzman, 2012). Perception of safety is enhanced by an increased awareness of one's surroundings and at night this coincides with the presence of illumination of public spaces, streets and transport hubs. This factor is related to the SF_L2 Visibility and the SF_L2 Security devices.

SF_L2 Openness

The geometrical conformation of space can in itself convey a sense of safety and control on the surrounding environment, through the factor of the field of view (Ceccato et al., 2022; Fenster, 2005; Fisher & Nasar, 1992; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Rossetti et al., 2019). If the field of view is wide the subject has a better understanding of the elements present in the surrounding space, if the field of view is narrow the limited amount of awareness of the environment leads to

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a feeling of fear and anxiousness. This factor is related to the SF_L2 Visibility and the SF_L2 Obstructions of visibility.

SF_L2 Visibility "eyes on the street"

The perception of being seen by others whilst in a public environment can be perceived as comforting, the concept of visibility stands for the potential to be seen by an outside party and thus to receive help and support in case of distress or threat (Ceccato et al., 2022; Koskela, 1999; Loukaitou-Sideris, 2006; Uteng, 2021). Visibility is determined by the presence of ground floor shop fronts, but also by the presence of windows of residential and busy buildings, mainly on the lower floors. This factor is related to the SF_L2 Openness, SF_L2 Lighting, SF_L2 Obstructions of visibility.

SF_L2 Obstructions to Visibility

Obstructions to visibility are elements that are present in the urban environment, due to its design, and can be a visual obstacle and create blind spots. These elements range from transportation systems such as cars and buses, to waste containers, to urban greenery. In the case of greenery, it has a positive impact in many aspects, however where safety is concerned the presence of greenery can often provide a perception of danger (Ceccato et al., 2022; Fenster, 2005; Fisher & Nasar, 1992; Golan et al., 2019; Loukaitou-Sideris, 2006; Rossetti et al., 2019). Much depends on the type of greenery used in the urban context, the care it is given, its location in space and the obstruction it causes to visibility. For example thin-stemmed trees don't cause less visibility, while shrubbery can provide hiding places. This factor is related to the SF_L2 Openness, SF_L2 Visibility, SF_L2 Barriers.

SF_L2 Architectural Barriers

Architectural barriers are present in most urban settings and are often inevitable (railways, highways, natural elements such as rivers). The borders are often spaces that create real divisions within the urban fabric and are seldom insufficiently maintained. This aspect, combined with the fact that barriers physically limit the number of exit routes and make them more distant from one another, makes architectural barriers influential in the perception of safety and safety itself (Ceccato

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et al., 2022; England & Simon, 2010; Loukaitou-Sideris, 2006; Rossetti et al., 2019; Whitzman, 2012). This factor is related to the SF_L2 Obstructions to visibility, SF_L2 Security devices.

SF_L2 Security Devices

The presence of security devices in public spaces can in many cases increase the perception of safety (Ceccato et al., 2022; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Pain, 2000; Uteng, 2021; Vitrano et al., 2018; Whitzman, 2012). In this case we are referring to two kinds of elements, the first kind that simply gives a feeling of visibility (CCTV) and the second kind that requires an active response of the individual, such as pushing a SOS button. Both kinds of devices have to be in a position in space where they are recognizable to have an actual impact on the perception of security. This factor is related to the SF_L2 Lighting and the SF_L2 Barriers.

2.2.2 The City Use

The SF_L1 'City Use', namely the presence of city users or the traces of behavior of other city users, influences the perception of security a great deal, particularly regarding the concept of fear of the other and the unknown. In this context, the identified Safety Factors - Level 2 include the following:

- SF_L2 Crime rate: reported crimes on streets related to assault, harassment, robbery;
- SF_L2 Homeless or encampments: presence of homeless groups and encampments;
- SF_L2 Sex work/ sex workers: presence of sex workers or the activity of sex work;
- SF_L2 Urban degradation: carelessness of streets, sidewalks and public spaces (filth, tags, etc.);
- SF_L2 Presence of people: sense of belonging, perception of anonymity and isolation.

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SF_L2 Crime Rate

Crime rate refers to the public acknowledgement that a certain area is subject to a high or low number of reported crimes, such as assault, harassment, robbery. A lot of the influence this index has with the perception of safety is related to the individual familiarity that each person has of the area, but it is also influenced by public media and various possible sources of information (Ceccato et al., 2022; England & Simon, 2010; Galbrun et al., 2014; Golan et al., 2019; Gorrini et al., 2021; Grove, 2015; Koskela, 1999; Lebugle et al., 2017; Loukaitou-Sideris, 2006; Pain, 2000; Pain, 2001; Vasquez-Henriquez, 2020; Whitzman et al., 2014). This factor is related to the SF_L2 Presence of encampments, SF_L2 Urban degradation and SF_L2 Sex work/sex workers.

SF_L2 Homeless or Encampments

The presence of encampments in cities is very problematic, primarily for those who live in them and are homeless. They are very divisive spaces both on a physical and relational level and also affect the perception of safety of those who walk around the city (Ceccato et al., 2022; England & Simon, 2010; Galbrun et al., 2014; Golan et al., 2019; Gorrini et al., 2021; Grove, 2015; Koskela, 1999; Lebugle et al., 2017; Loukaitou-Sideris, 2006; Pain, 2000; Pain, 2001; Vasquez-Henriquez, 2020; Whitzman et al., 2014). The key issue to keep in mind is the positioning of people who fear these spaces, as in most cases, it is a privileged position of those who have a home, and the disadvantaged positioning of those who are homeless and in need of adequate and affordable housing (Loukaitou-Sideris, 2006; Pain, 2000). This factor is related to the SF_L2 Crime rate and SF_L2 Urban degradation.

SF_L2 Sex Work or Sex Workers

Sex work is defined as "paid employment in the sex industry, comprising prostitution and pornography" (Oxford Dictionary). Sex work has also been related to the urban geography, often marginalized towards the outskirts of the city and associated with urban degradation (Golan et al., 2019). The activity is consequently linked to a perception of insecurity (Pain, 2000) and in particular the so-called "red-light

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districts" commonly perceived as feared places for sexual harassment (Koskela, 1999). This factor is related to the SF_L2 Crime rate and SF_L2 Urban degradation.

SF_L2 Urban Degradation

Urban degradation is often a sign of an inhospitable environment. Urban degradation and decay means neglect of streets, pavements and squares, a consequence of which is the presence of litter throughout the city due to poor waste management (Ceccato et al., 2022; Golan et al., 2019; Koskela, 1999; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Pain, 2000; Rossetti et al., 2019; Uteng, 2021). The carelessness regarding the state of the streets is also linked to a community's lack of interest or inability to maintain a hospitable, hygienic and liveable space. This factor is related to the SF_L2 Crime rate, SF_L2 Presence of people and SF_L2 Sex work.

SF_L2 Presence of People

The presence of people influences the perception of security related to the possibility of receiving social support, albeit from strangers, rather than a feeling of desolation and isolation (Ceccato et al., 2022; England & Simon, 2010; Grove, 2015; Koskela, 1999; Lebugle et al., 2017; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Ramirez et al., 2021; Rossetti et al., 2019; Uteng, 2019; Uteng, 2021; Vitrano et al., 2018). It is necessary to point out the intersectionality embedded in the concept of "people", presence of people can create a perception of safety or insecurity based on the intersectionality of the viewer and the intersectionality of the people occupying the space at that time. If we set the example of a public square full of a heterogeneous group of people (children, women, elderly etc.) and the same public square filled with exclusively male bodies, someone looking through a gendered lens will see two very different squares, particularly regarding the perception of safety in a male-dominated space. This factor is related to the SF_L2 Urban degradation.

2.2.3 Hotspots

The SF_L1 'Hotspots', namely landmarks in the urban environment that have a distinct connotation and can be considered as safe havens and no-go areas within the city. Hotspots are specific places that are recognizable within an urban

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environment, as such they are related to all of the other factors SF_L1 Spatial Features and SF_L1 City Use, in particular the SF_L2 Presence of People. In this context, the identified Safety Factors - Level 2 include the following:

- SF_L2 Transport hub (bus stop/ tram stop): transport infrastructures of small dimensions;
- SF_L2 Railway stations: transport infrastructures with a big dimensional impact on the city;
- SF_L2 Businesses: presence and opening of commercial activities;
- SF_L2 Public spaces: squares and tactical urbanism interventions;
- SF_L2 Spaces of gathering: cultural, social, recreational, aggregation, educational centers;
- SF_L2 Parks: large urban green areas and parks;
- SF_L2 Open spaces: large parking, dismissed/ abandoned areas;
- SF_L2 Law enforcement units: police stations/ patrols.

SF_L2 Transport Hub

A transport hub is a recognizable transport infrastructure that can represent a known place, the connection to a known place or the presence of people (such as transport users and transport sector workers). It can vary in size and attractiveness, however it remains a precise orientation point for who knows or doesn't know the city. The concept of a transport hub is quite generic and can comprehend different kinds of urban elements, they can vary from a subway station (equipped with all the relative services and facilities), to a bus stop on the side of the road, the middle ground would be a bus/ tram stop equipped with a shelter, seating space and night lighting (Ceccato et al., 2022; Gorrini et al., 2021; Koskela, 1999; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Uteng, 2021; Vasquez-Henriquez, 2020; Vitrano et al., 2018; Whitzman, 2012).

SF_L2 Railway Stations

Railway stations are some of the main landmarks within a city. They are large-scale facilities within the urban fabric and create indoor and outdoor public spaces. In addition to the function of interconnection and transit through the facility, the railway

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station usually contains areas for breaks, meet-ups and commercial services. Within this framework, stations can create a space of security given the presence of people, video surveillance cameras. However, especially at night, railway stations and their surrounding areas often host aggregations of homeless people, drug dealing and a high crime rate (Ceccato et al., 2022; Koskela, 1999; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Uteng, 2021; Vasquez-Henriquez, 2020; Whitzman et al., 2014; Whitzman, 2012).

SF_L2 Businesses

Presence of open businesses can provide a point of reference especially in particularly desolate neighborhoods and during evening and night hours. Similarly to transport hubs, businesses often mean the presence of people such as the clients and the owners. In some cases businesses are specifically equipped to welcome and aid anyone in need of help due to gender based violence, however it's a key element for these places to be recognizable (Golan et al., 2019; Gorrini et al., 2021; Koskela, 1999; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Rossetti et al., 2019; Uteng, 2021; Vitrano et al., 2018).

SF_L2 Public Spaces

Public spaces are intended as meeting places, therefore equipped public squares with urban elements such as benches, tables and children's games. The presence of public art and tactical urbanism are also considered relevant elements which tend to encourage the use of public space. In the case of public spaces one can associate the presence of diverse groups of people, ranging from young children to elderly people. Public space has been linked to positive aspects related to social life and empowerment, but also in the experience of being a woman in public space and the risk of being exposed to verbal, physical and sexual violence (England & Simon, 2010; Koskela, 1999; Lebugle et al., 2017; Levy, 2013; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Pain, 2000; Pain, 2001; Ramirez et al., 202; Uteng, 2021; Vitrano et al., 2018).

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SF_L2 Spaces of Gathering

Spaces of gathering are understood as recognisable centers of cultural, social, recreational aggregation. Closed spaces with a public and social vocation, such as cultural centers, centers for the elderly, sports and leisure centers and schools. The influence these spaces can have is merely the possibility of there being other people, however it's quite unlikely to find such a place without knowing of its existence prior (Loukaitou-Sideris, 2006).

SF_L2 Parks

Parks within urban contexts can be more or less nature-like, with areas featuring services, sports facilities and playgrounds. Other areas may contain more vegetation and biodiversity, and are more naturalistic. In general, parks contribute to the capture of CO2 and act as green lungs for cities. However they can be spaces that are perceived as unsafe and male-dominated, particularly during the night (Fenster, 2005; Golan et al., 2019; Gorrini et al., 2021; Koskela, 1999; Loukaitou-Sideris, 2006; Pain, 2000; Rossetti et al., 2019).

SF_L2 Open Spaces

Open areas are large unused spaces in the city, which were previously used for activities that are no longer in place or they are areas resulting from the construction of buildings or infrastructures. Unlike parks, which have an important environmental aspect, the large open areas we are referring to are often disused or at most used as large unattended car parks and become potentially dangerous spaces for those who find themselves crossing them (Golan et al., 2019; Gorrini et al., 2021; Koskela, 1999; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Pain, 2000; Whitzman et al., 2014; Whitzman, 2012).

SF_L2 Law Enforcement Units

When referring to law enforcement units these include police stations, static locations that can be found on online maps and police patrol stations that move around the city and have different timetables and shifts and are more active in specific places and at specific times. Police units are an element that should guarantee security in a

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public space, and this is usually the case (Vitrano et al., 2018). However, the presence of a certain number of armed forces could in turn cause a perception of insecurity. This perception is also a consequence of the intersectionality of cases, it depends upon many factors and also recent experiences of police violence towards certain categories of people (Golan et al., 2019; Gorrini et al., 2021; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Uteng, 2019).

2.2.4 Approach, Timeframe and Tools

During the Literature Review activity, further categorisations emerged within the scientific papers, some of which contributed to the vertical development of the final project theme. Based on how the research papers were developed, they were categorized by Gender Approach, Timeframe and Tools (see Annex III).

- Approach: this refers to the way the topic of gender is addressed in the context of each scientific article, it can be as follows:
  - General (Galbrun et al., 2014; Rossetti et al., 2019): the paper is not aimed at a certain demographic group;
  - Gender-focused (Ceccato et al., 2022; Golan et al., 2019; Gorrini et al., 2021; Lebugle et al., 2017; Levy, 2013; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Uteng, 2019; Uteng, 2021; Vasquez-Henriquez, 2020; Vitrano et al., 2018; Whitzman, 2012): the research is strictly related to gender, often through a binary approach, without considering the interconnections with other demographic characteristics;
  - Intersectional (Beebeejaun, 2017; England & Simon, 2010; Fenster, 2005; Grove, 2015; Koskela, 1999; Lebugle et al., 2017; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Pain, 2000; Pain, 2001; Uteng, 2019; Whitzman et al., 2014): the paper uses an intersectional approach, where gender is studied in intersection with multiple other factors of discrimination, such as age, economic status etc.
- Timeframe: this categorizes the research papers on the basis of whether they focus on a specific period of the day or not, which is a relevant factor in the

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topic of perception of safety and security. Research based on different time periods can offer very different insights. The timeframes are classified as follows:

- Undefined (Beebeejaun, 2017; England & Simon, 2010; Fenster, 2005; Galbrun et al., 2014; Gorrini et al., 2021; Grove, 2015; Lebugle et al., 2017; Levy, 2013; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Pain, 2001; Rossetti et al., 2019; Uteng, 2019; Uteng, 2021; Vasquez-Henriquez, 2020; Vitrano et al., 2018; Whitzman, 2012): the period of the day isn't relevant for the research paper;
- Daytime (Ceccato et al., 2022; Golan et al., 2019; Koskela, 1999; Ramirez et al., 2021): the research paper focuses on the daytime period;
- Night (Ceccato et al., 2022; Koskela, 1999; Uteng, 2019; Vitrano et al., 2018): the research paper focuses on the nighttime period.

– Tools: the papers analyzed in the Literature Review presented a vast number of assessment tools including a wide range of methodologies and techniques that have been developed to empirically measure the perception of safety for women walking (see in Annex 6.3):

- Geographic Information Systems (Ceccato et al., 2022; Galbrun et al., 2014; Golan et al., 2019; Gorrini et al., 2021; Grove, 2015): these methods can be applied to characterize a neighborhood level of safety and safety perception through the analysis of location-based data related to the topographical, cadastral, infrastructural, and architectural features of urban areas (e.g. presence of public services, quality of road infrastructures, demographics, etc.). As an example, the use of GIS offers the possibility to evaluate if an area is characterized by efficient lighting, presence of open businesses or reported crime locations in a certain area; all factors which are correlated with women's perceptions of safety;
- GPS and Smartphone Apps Data (Beebeejaun, 2017; Ceccato et al., 2022; Gorrini et al., 2021; Rossetti et al., 2019; Vasquez-Henriquez, 2020): GPS and apps data can be applied to produce behavioral maps

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by systematically annotating where pedestrian movements occur in a certain environment (e.g., people counting, pedestrian trajectories, etc.). Crowd-sourced safety reporting and mapping tools such as Wher App and Safetipin could further provide information about perception of safety directly from the end users;

- Questionnaires and Focus Groups (Ceccato et al., 2022; Golan et al., 2019; Grove, 2015; Koskela, 1999; Lebugle et al., 2017; Levy, 2013; Loukaitou-Sideris, 2006; Loukaitou-Sideris, 2014; Pain, 2001; Ramirez et al., 2021; Rossetti et al., 2019; Vasquez-Henriquez, 2020; Vitrano et al., 2018; Whitzman et al., 2014; Whitzman, 2012): audit tools are based on the use of validated measures, self-reporting, survey questionnaires, and interviews to study the subjective perception of women about the level of safety of a predetermined urban area. These are generally not geolocalized inputs, although in-situ safety auditing methods such as neighborhood walks or community mapping can be used to identify localized hotspots. Co-creation methods, such as focus groups and design laboratories, can also be applied to directly engage users through participatory design processes.

2.3 Case Studies and Policy Benchmarking

Task 2.2 'Case studies and Policy Benchmarking' refers to the review of documents that are not categorized as scientific papers but are nonetheless useful to gain a perspective on the issues in various contexts and an overview on how these are tackled by global field experts. These include reports, policy papers, green papers, planning guides and handbooks (see Annex IV, Annex V, and Annex VI). For the sake of simplification, documents are categorized broadly herein as: (*i*) reports (e.g., thematic reports, policy papers, green papers, etc.); and (*ii*) guidelines (e.g., planning guides, policy guides, handbooks, etc.). The final part of this section also highlights case studies revealed through the document review, that relate to the experience of women's walkability in public space with a particular focus on safety.

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2.3.1 Benchmarking process

The benchmarking process was focused on the selection of relevant documents that focus on gender-sensitive urban planning and, in particular, the relationship between cities, gender, walkability and safety with a global overview. The selected documents (30 in total), published between 2009 and 2023, were also selected on the basis of geographical diversity. The multiple documents analyzed highlight that gender in the context of mobility, in this case specifically related to the perception of safety while walking, is in fact an issue of global relevance. The selection of documents also aimed to discuss walkability in its various forms: walking as a mode in and of itself to reach destinations within the city (usually in near-home environments), walking as a first-and-last-mile solution in conjunction with public transport or other travel modes, and walking as a leisurely activity in parks and public spaces. This classification allows the readers to have a broader overview of the issue of walkability in relation to gender within a multi-modal and multi-spatial urban mobility context. Documents that focused exclusively on public transport or other modes of travel were excluded from the analysis.

The documents are categorized by typology as follows:

- Reports present an overview of the current situation in a specific context, introducing the main issues and often including original studies carried out by the researchers in the selected context. Reports often include a short section outlining recommendations for policy actions or physical intervention strategies based on the results of the report studies. These are distinct from guideline documents whose primary aim is to present tools for planning and design;
- Guidelines are practical documents designed with the aim to offer strategies, action plans or replicable methodologies to plan cities with a gendered lens, especially in relation to walking, safety and public space. These include planning guides for the inclusion of women and women's needs in urban planning processes or policy recommendations targeting existing policies and legislation. Alternatively, guideline documents can focus on practical spatial design and management measures following gender-sensitive design

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principles. In most cases, guideline documents offer a combination of these approaches and are aimed at a mixed audience.

It is important to note that while some documents may combine between typologies (for example, some guideline documents may have a small report section to introduce the issues and vice versa), for the purposes of a systematic review, each document herein is categorized exclusively based on its key objectives. This led to a total collection of 20 reports and 10 guidelines, which can be reviewed in Annex IV, Annex V, and Annex VI, respectively. Each of the above categories is analyzed according to criteria that are relevant to the document type. The following sections will outline the main criteria considered for each document typology, discussing the main findings associated with each.

2.3.2 Reports

In total, twenty reports have been reviewed, ranging from global to local reports contextualizing the issues within diverse areas of interest. All of these documents focus, in part or in full, on the issue of walkability and the diverse factors that come into play in relation to the needs of women and diverse gender identities in cities. Fifteen of the reports also include an original study relating to a particular area of interest focusing on factors that influence perceptions of safety in public space or on public transport. The methodologies and diverse data gathering methods used in these studies are outlined in the sections below.

Geographical Scale and Focus

There is a good balance among the reports in terms of the geographical scale of background studies (secondary research): Global (8 documents), Regional or specific country groupings, such as Global South or developing countries (4), and Local studies, which focus either on a specific city or country (6). Among the reports that include original studies, the scale of focus varies between global and local scales from national to city scale and down to the district level. Original studies included in the reports cover a total of 24 cities in 23 different countries spread out geographically, equally distributed between regions of the Global North (12 cities in 12 countries)

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and Global South (12 cities in 11 countries). The highest number of studies by country come from India (5), Argentina (3) and the United Kingdom (3). The most studied city is Delhi (5 studies), followed by Buenos Aires, Cairo, Lima and Kampala (two studies each). Below is a map showing the locations of the original studies represented in all reports combined by country, the color scale indicating countries with a higher number of studies as per the legend (see Figure 2-4).

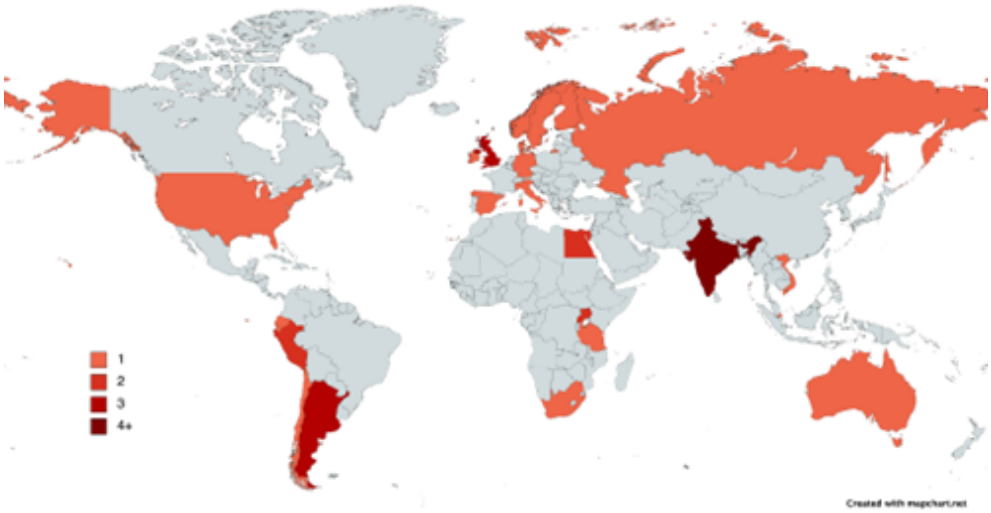

Figure 2-4 Map of original study locations included in reviewed reports

Transport Modes

The reviewed reports reveal crucial aspects in the relationship between women and public space considering different modes of mobility. Apart from walking (discussed in all 20 documents), the reports also discuss issues of women's mobility experiences in relation to public transport (14 documents), cycling (10 documents), private vehicles (8 documents) and other mobility modes, such as micro-mobility, shared mobility and microtransit (8 documents).

These references underline the fact that safety is a common concern in women's mobility experiences in the city, whether in transport spaces (vehicles, hubs) or in transport environments (walking to the station, etc.). It is important to remember that multimodal trips make up the majority of trips in cities, and so, the experiences in different transport modes are often overlapping and interrelated. In that sense, it

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is important to consider walkability within the wider transport context to highlight the nuances in experience between different segments of a woman's same trip or journey. Allen et al. (2016), for example, study women's transit experience divided into 3 main components: access and egress to public transport, the waiting environment and the in-vehicle experience.

Common Themes

Certain common themes were identified that relate to the goals of STEP UP. Most of the reports in the sample focused on the impact of spatial features of the urban environment on women's perceptions of safety while walking (Allen, 2018; Allen & Vanderschuren, 2016; Arup, 2022; Barker et al., 2022; Lambrick et al., 2010; Loukaitou-Sideris et al., 2009; Ramboll Smart Mobility, 2021; Shah et al., 2017; Walker, 2022; Safetipin, 2022). In studying perceptions of safety on public transport, Allen et al. (2018) focuses more on aspects such as speed of the transit mode, travel time and frequency, as well as the in-vehicle conditions and how these affect women's feelings of safety and comfort.

In addition to this, many of the studies presented in the reports also focused on the role of individual characteristics or intersectional identities on the subjects' perceptions of safety (Allen, 2018; Allen et al., 2018; Arup, 2022; Barker et al., 2022; Goulds and Tanner, 2018; Lambrick et al., 2010; Loukaitou-Sideris et al., 2009). Some of the common socio-demographic features considered in the analyses were age, occupation, family structure (female/male heads of household), socio-economic status (with a particular focus on poverty), religion, ethnicity, LGBTQIA+ identity, nationality and disability status.

Data Collection Methods

The collection of analyzed reports utilizes diverse methodologies and data collection methods. Most of the reports in the sample employed some form of desk research to present background studies on the topic. In addition, about half of the sample presented a literature review on the thematic focus and/or review of existing transport data.

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Of the 15 reports that contained an original study, the most commonly used methods for data collection were Focus Group Discussions (11 documents), Surveys or Questionnaires (10 documents), and Interviews with users, experts or stakeholders (9 documents). Other common methods include online safety reporting tools or applications (5 documents) and safety audits and/or neighborhood safety walks (3 documents). Some specific methodologies stood out. Barker et al. (2022), for example, relied on Q methodology to combine both a quantitative and qualitative assessment and collect subjective opinions on the impact of physical urban features on perceptions of safety. Participants were asked to sort and rank preselected statements about the topic on a grid, the q-sorts were then statistically analyzed to understand how different groups of women rank their perceptions of safety differently regarding certain environmental features. An overview of the methodologies used in all 15 references is shown below (see in Annex 6.5) showing names of specific tools where relevant.

The studies that utilized online mapping tools to collect data were varied. Some relied on data collected from tools or applications that were already in use and analyzed their existing datasets (Fahmy et al., 2014). Others relied on already existing tools to collect new data from the field, such as SafetiPin Nite and SafetiPin Site (Safetipin, 2022; FIA Foundation & Safetipin, 2020). In other cases, safety mapping tools were specifically designed to collect data for the study and were made accessible for a limited timeframe to collect data from users in one or several cities (Arup, 2022; Goulds & Tanner, 2018).

Highlighted Reports

Below, a selection of particularly revelatory and influential publications with respect to the objectives of the STEP UP project are presented and their arguments discussed in some detail.

– "Milan Gender Atlas" is a book by Florencia Andreola and Azzurra Muzzonigro (2021) which analyzes the city of Milan and seeks to bring attention to the female perspective in the context of city planning. It also focuses on the dichotomy between the social role of women as relegated to home and

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domesticity and the public spaces as environments considered to be for men. The book aims to create a gender-related geography of Milan and provide a platform for dialogue and collective construction of an inclusive city. By identifying and describing elements of the city that are relevant from a gender perspective, the book features descriptive maps of the city of Milan and interviews with members of the public administration and professional experts in the field. The main goal is to offer tools to ask the right questions and disclose power relations behind space conception, rather than provide definitive answers. From the symbolic representation of women in the public space, to travel patterns differentiated by gender, to violence and insecurity in private and public spaces, the report conveys a comprehensive overview of the city of Milan from a gender perspective;

– "Buenos Aires Safety and Accessibility Mapping of 8 Socially Vulnerable Neighborhoods" is a report which studies women's safety, accessibility, and mobility in 8 vulnerable neighborhoods of Buenos Aires. It was published by Safetipin in 2022 and commissioned by the CAF - Development Bank of Latin America. It focuses on the mobility of women in 8 vulnerable districts in Buenos Aires to elaborate on the compounded inequality and mobility obstacles faced by women living in particularly vulnerable situations. Following a local approach, the report includes a list of recommendations for improving the safety of women and girls in the studied neighborhoods based on the findings of the environmental analysis of each district. The report identifies key safety, accessibility, and connectivity concerns for women using quantitative and qualitative tools such as safety audits, bus stop assessment questionnaires, user perception surveys and safety reporting applications (SafetiPin Nite and SafetiPin Site). SafetiPin Nite collects images at evening and night (6-8pm and 8-10pm) of the urban environment which is later analyzed by image analysts to create thematic maps and correlation maps. SafetiPin Site is an online tool to qualitatively analyze the conditions of certain geo-referenced locations, used here to assess bus stops in the neighborhoods. The Appis based on 9 parameters: lighting, openness,

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visibility, presence of people, security, walk path, access to public transport, gender usage and feeling.

2.3.3 Guidelines

Many relevant organizations at global and local scale (UN Habitat, World Bank, Development Bank of Latin America, Cities Alliance, etc.) have developed policy guidelines for the planning and design of cities with a gender perspective.

These documents, aimed at diverse urban actors, include methods, tools, activities, actions and recommendations to be taken into account for the implementation of programmers and projects that address women's needs to guarantee inclusive cities that work for all. The scopes of the documents are diverse and are aimed at a multitude of urban actors within various geographical contexts.

There are 10 guideline documents in total included in this guideline review: six of these give practical tools to integrate wide-ranging gender-based issues into actions of urban planning and policy, and the remaining four focus on ways to tackle the specific gendered issue of safety while walking and in public space. In Annex 6.6 includes a full list of the guidelines studied within this review.

Geographical scale

The selected guidelines are diverse in terms of their approach with respect to geographical scale. As shown in Annex VI, a distinction is made between scale of Area of Interest (the area under study) and scale of target area (the geographical scale that the document targets for action).

In most cases, the guidelines are targeted towards cities. The scale of the Area of Interest differs between the documents and follows the following logic:

– Global approach stands for a document that tackles the issue on a worldwide scale of interest. Any document that aims at having a global approach will be versatile and maintain a general framework. These include Her City, a practical participatory planning guide with step-by-step toolbox for urban actors interested in initiating a girl-inclusive urban project or plan, as well as a toolbox for gender action plans aimed at 3 different stakeholder groups:

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public, private and citizens - organizations and individuals (Andersdotter Fabre, et al., 2021; Terraza et al., 2020). Both of these documents are considered general planning guides;

- Regional approach stands for a document studying large areas of interest that include several geographically proximal countries or countries with similar social, economic or political structures, such as Latin America, developing countries or the Global South. This offers the chance to compare certain aspects concerning safety for women walking on the premise of assumed congruence. There are 4 regional guidelines included in this review: three provide a general framework for applying a gender lens in urban plans (Cities Alliance, 2022; Drăguțescu et al., 2020; Tandon Mehrotra et al., 2022) and one is targeted on the issue of safety in public space (ActionAid, 2013);
- Local approach stands for a document that studies the case of one or several specific areas of interest (cities, countries) as stand-alone contexts without the prerequisite of regional connection or proximity. These guidelines usually go in-depth on the issues of a particular city or district within a city. In some cases, these guidelines fall within a particular project framework, and are commissioned by an authoritative body for the specific goal to improve the level of safety of an area within its jurisdiction (Taft et al., 2020).

Target Audience

In most cases, the guidelines were aimed at a wide range of stakeholders and urban actors involved in urban decision-making processes. For simplification, the target audience was divided into the following 3 broad categories:

- Public entities (public administrations, local city authorities, council officers, etc.);
- Private entities (such as landowners, real estate developers, professionals and experts in the field, practitioners and residents);
- Third sector organizations (such as NGOs, academic institutions, community organizations and advocacy groups, etc.).

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In specific cases, guidelines were designed to address internal actors within the organization bodies issuing the guideline. This applies to the case of "Gender-Inclusive Urban Planning Design", which targeted World Bank staff involved in designing, managing, delivering, and evaluating urban planning and design projects as well as Government clients and Contractors, as well as the case of "Making Cities and Urban Spaces Safe for Women and Girls", which was developed by ActionAid and was specifically designed to be used by the working teams of ActionAid International and ActionAid's country offices (ActionAid, 2013; Terraza et al., 2020).

Common Themes

Given the diversity of the selected documents and their limited number, it is difficult to infer common themes from their contents. However, some elements stand out in relation to the scope and approach of the reviewed selection. The first set of guidelines are handbooks for gender-inclusive urban planning focusing on different elements of the planning process:

- Tandon Mehrotra et al. (2022) presents an overall framework for addressing a range of dimensions of city life from the perspective of women by placing the economics and ethics of care at the center;
- Andersdotter Fabre et al. (2021), Cities Alliance (2022) and Terraza et al. (2020) focus on the participatory process in all phases of the gender-inclusive plan. The HerCity guide focuses particularly on the inclusion of young girls in the planning process, providing a step-by-step toolbox for interested parties, emphasizing the importance of participation of girls of a young age (Andersdotter et al., 2021);
- Drăguțescu et al. (2020) and Generalitat Valenciana (2022) are designed as gender inclusion guides to support specific planning guidelines and laws in their respective territories. Drăguțescu et al. (2020) is intended as a support guideline for the SUMPs within the European context whereas Generalitat Valenciana (2022) aims to support the law on territorial planning LOTUP for the city of Valencia. Generalitat Valenciana (2022) elaborate on specific recommendations by different thematic content blocks of the LOTUP

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including climate change, mobility, equipment, services, housing, etc., fully equipped with priority actions, guiding questions and self-assessment indicators.

The second set of guidelines are designed with the specific focus on strategies to enhance women's safety in public spaces:

- Action Aid (2013) and Taft et al. (2020) focus more on elements of the planning process. Action Aid (2013) is a participatory toolkit for conducting safety audits in 5 countries of the global south. It elaborates on tools developed for the Safe Cities Initiative adapted to contextual local needs. Taft et al. (2020) is a guideline published by the city of Melbourne focusing on safety in public transport environments for women. It provides gender-sensitive toolkits that circle around data collection and analysis, placemaking and safety measures, as well as communication campaigns and training;
- Simon and Stoppi (2021) and Safer Parks Consortium (2023) aim to promote gender-sensitive design principles for walking environments of different natures. Simon and Stoppi (2021) is focused on the UK context and is particularly concerned with walking as a first and last mile connection with public transport and other transport facilities. It starts by considering factors of the decision-making process of a female user before, during and after her journey, identifying opportunity areas for designing safer experiences for women. Safer Parks Consortium (2023), which also focuses on the UK context, deals instead with safety measures for walking in leisure contexts, i.e. in parks in particular. It is based on research by the University of Leeds from which a set of gender-sensitive design and management principles were developed both to adapt existing parks and to develop new ones.

Highlighted Guidelines

- "HerCity[13]" is a Guideline for sustainable and inclusive cities, it was published in 2022 and commissioned by UN Habitat and Global Challenge. It has a

[13] See: https://hercity.unhabitat.org/

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global approach and methodology that can be applied in cities globally, its target users are urban actors, professionals and citizens in general. The document offers toolboxes with a cost-efficient process to be incorporated in the development of cities and communities, it's divided in three main phases, each divided in three main blocks (assessment, design and implementation). Each block leads through a number of activities with detailed steps to follow in order to deliver urban feminist projects and with help of digital tools such as checklists, calendars, agendas, manuals, forms, boards, apps, templates, surveys etc. One year after the launch the digital toolbox has been used in 350 cities in 100 countries. The document provides information on many case studies involved in the use of HerCity as a tool;

- The "Handbook for Gender-Inclusive Urban Planning and Design" is a Policy Guideline for implementing gender-inclusive planning and design processes globally. It was published in 2020 by the World Bank and commissioned by the International Bank for Reconstruction and Development. It has a global approach and methodology that can be applied in cities around the world. Its target users are urban actors, professionals, citizens and public administrations. The document gives guidance on flexible, adaptable actions and activities that can be applied throughout the course of a plan or project development in any context, with a focus on establishing gender principles; monitoring, evaluation, accountability, and learning; community participation; and considerations for project implementation;
- The "Women-friendly urban planning: a toolkit from cities of the global south" is a Guideline which provides tools and activities for the implementation of gender sensitive projects. It was published in 2022 by Cities Alliance in collaboration with Womenability and commissioned by the Swedish International Development Agency (SIDA). It has a regional approach and methodology that can be applied in cities of the Global South. Its target users are international development professionals, city officials and Cities Alliance staff. The toolkit contains two main parts. The first one presents the steps for gender mainstreaming within the participatory process, while the second

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one gives recommendations of how to design gender-fair participatory processes by presenting necessary data and tools to choose and advising on how to communicate in a gender-sensitive way;

– "Guidelines for gender perspective mainstreaming in urban planning actions in the Valencian community" is a Guideline with a local approach; it was published in 2022 by the public administration and commissioned by the Regional Ministry of Territorial Policy, Public Works and Mobility of Valencia. The LOTUP, a law on territorial planning, urbanism, and landscape in the Valencian Community, aims to integrate an inclusive gender perspective into urban planning. Its target users are decision makers and citizens. The Guideline outlines three objectives: supporting decision-makers in mainstreaming gender perspective, assisting urban planning drafting teams in transferring gender determinations, and advising drafting teams on how to draft planning documents in line with the LOTUP's requirements.

2.3.4 Case studies

Within the benchmarking process, many documents included descriptions of existing and implemented case studies in order to set an example of good practices. The Case Studies correspond with the practical implementation that follows from the knowledge and support of the documents described above. They are divided in two categories:

- Urban projects: architectural design projects implemented locally usually by municipalities;
- Urban initiatives: initiatives that aren't physically intended to change the public space, but have other functions such as increasing knowledge, the betterment of existing services and creating new services.

Urban Projects

During the last decades, concrete actions around the world have been carried out to improve safety for women in public space resulting in urban and architectural design projects. Some local interventions like Plaça d'en Baró in Barcelona or Einsiedler Park

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in Vienna, have engaged girls and women in the process of creating or regenerating these public spaces demonstrating that participation on decision making is a necessary and efficient process to achieve a more inclusive and equitable urban development:

- LEV! Tunnel is an underground passageway in the railway station of Umeå in Sweden; it was completed in 2012, commissioned by the Municipality of Umeå and designed by the group FA+ ART. It connects the city center with the Haga neighborhood. It's an urban planning project that combines architecture, art and the experience of a safe environment, built through a feminist lens. The architecture aims to guarantee a perception of safety through broad dimensions and designated lines for bikes, walking completely accessible for strollers and wheelchairs. The visibility is taken into account as there are no pillars or obstacles and all corners are rounded. The artificial lighting had been chosen to convey the feeling of natural light and the roof extends no further than needed to have an overview from both sides of the tunnel;
- Einsiedler Park is a square in the city of Vienna, Austria; it was completed in 2001, commissioned by the Stadt Wien and designed in consultation with people and particularly girls throughout various workshops. Vienna was the first city to implement gender mainstreaming. Many public spaces have been redeveloped as a result such as Einsiedler Park, a small square located in a multi-ethnic neighborhood. One of the main strategies was to implement a quick attraction which would attract the girls and invite them to engage with the space. This was done by incorporating different elements like hammocks, installations and platforms along the pedestrian paths. Other interventions such as increasing the entrances, providing wider paths, improving lighting, redistributing the spaces and incorporating new games and equipment guaranteed a safe and attractive public space;
- Plaça d'en Baró is an urban redevelopment project located in Barcelona and designed by Equal Saree in 2019, it was co-created with children of the municipality of Santa Coloma de Gramenet in Barcelona. The objective of the

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project was to rethink the use and activities of the square, in collaboration with a group of girls and boys from 6 to 12 years, in order to create an inclusive, diverse, vibrant and safe public space. The project was developed in three phases. In the first two phases a participative process was done in the square itself and in the school next to it with the students, while in the last phase consisted in the renovation of the plaza. The result is a vibrant urban project which provides inclusive and diverse games, comfortable areas with the incorporation of vegetation and a welcoming public space which improves the perception of safety;

- Frizon was inaugurated in 2016 and it's a public space by the river intended to be a place to socialize. It was designed for a specific group of people, i.e. young girls, as a response to the more dominant use of public spaces by boys (a recently built skate park in particular). The municipality worked with different groups of girls aged between 15 and 20, focusing the discussions on how girls felt in specific public spaces and what they would have wanted. What came out was a space free of expectations, a place to hang out alone or with friends. The space was designed with seating areas, electrical outlets, WiFi and the possibility of listening to music on speakers (Dahlqvist, A. et al, 2019);
- Her City urban development project in the neighborhood Corvetto in the city of Milan (Italy) - ongoing project.

Urban Initiatives

Recent research reveals that girls and women don't use public space as boys and men do, so it has become more and more crucial to consider their needs in planning public space in order to make them feel included and safe (Andersdotter Fabre et al., 2022). Many urban initiatives have been put in place through public services, mapping of gender based violence and creation of apps, below are some examples.

- Traveling alone at night - "Between stops"[14] service is an urban initiative implemented in 1996 in Montréal, by the Société de transport de Montréal

[14] See: https://www.stm.info/en/info/advice/travelling-alone-night

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(STM). Its aim is to improve the safety of women traveling alone at night on the bus network. The service allows drivers to drop off women between stops in order to avoid acts of violence and harassment when walking from the bus stop to home or other destination. Since now, the service works for everyone who might feel unsafe traveling by night;

- "Donnexstrada"[15] is an association that offers help to victims of gender-based violence, while providing concrete tools to prevent the recurrence of gender violence dynamics. It started out as a method to guarantee the right to return home safely at night by connecting the community through social networks. Donnexstrada also started a project called Punti Viola, based on educating staff of any kind of commercial activity on harassment and gender-based violence, thus creating safe spaces for women in need and increasing information on this issue. These commercial activities are mapped and are now in all of Italy;
- "HarassMap"[16] is an urban initiative launched in 2010 in the city of Cairo. It's aim is to take a stand against sexual harassment by engaging society to act upon it and build a society free from sexual and gender based violence. The service consists of an online map where anyone can report either an incident of sexual harassment or an intervention (someone intervening to stop a sexual harassment incident), the information is anonymous, geo-located and the time of day is also available. The HarassMap aims to expand knowledge on sexual harassment and recognition of it as a form of sexual violence and a crime, in a society that had become increasingly tolerant on the subject;
- "Gendered Landscape Tour"[17] has the aim of showing the city with a different perspective: it shows how gender plays a role in the political and social landscape that constitutes Umeå Municipality. Highlighting positive examples

[15] See: https://donnexstrada.org/
[16] See: https://harassmap.org/en/
[17] See: https://genderedlandscape.umea.se/in-english/

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of feminist planning and analyzing the shortcomings that often characterize the urban environment (Dahlqvist, A. et al, 2019);

– "1522"[18] is a public service promoted by the Presidency of the Council of Ministers - Department for Equal Opportunities. The number is free of charge and active 24 hours a day, its aim is to receive requests for help and support from victims of violence and stalking through the work of specialized operators. The service also worked on the national mapping of Anti-Violence Centres (CAVs) and Shelter Houses (CRs) present throughout the country which is available online on the websites of the Department for Equal Opportunities and '1522'.

2.4 Conclusions

The Use Cases Definition (WP2) consisted of a diversified document review focused on the theme of walkability in intersection with gender, with a particular focus on the issue of safety. The review was split between a scientific literature review covering the latest and most relevant scientific papers on the topic, a review of global reports on the topic (country reports and project reports by global organizations dealing with the theme of gender in urban planning and transport) and a review of key urban design and policy guidelines tackling gender inequality in cities. The mixed document approach enabled an overview of the subject matter; from a scientific perspective aiding in the formulation of the research approach to practical tools and guidelines to aid in the development of an intervention plan for the city of Milan. Specific case studies were also extracted from the reviewed documents to highlight good practices and global initiatives designed to address the issue of walking safety for women in various urban contexts.

The thematic literature review focused on findings from 23 scientific references revolving around the keywords gender, safety and walkability. The papers represented contributions spanning the last two decades, focusing in particular on recent contributions published after 2015. The key learnings obtained through the

[18] See: https://www.1522.eu/

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literature review process mainly consist of the individuation of Safety Factors as indicators related to the perception of safety in public space and their relation to the theme of gender. These safety factors, verified by the research, create the basis for data collection in consecutive phases of the project.

The report review covered a collection of 20 reports, divided between global, regional and local focuses. All reviewed reports focused on issues of urban walkability for women in the respective contexts, emphasizing the importance of walking as a travel mode in particular for women in situations of poverty. A significant share of the reports also discussed women's experiences in public transport, as well as other mobility modes. The analysis highlights the important relationship between mobility experiences in various modes of transport and emphasizes the importance of studying walking as part of a multimodal trip, as is most commonly the case in cities. It also highlights the importance of studying perceptions of safety and walkability in relation to various intersecting dimensions of identity along with gender, such as age, ethnicity and economic conditions.

The majority of the reports featured original studies spanning a wide geographical focus (24 cities in 23 countries), evenly split between cases of cities of the Global North and Global South. These original studies relied on diverse data collection methods, most commonly: Focus Group Discussions, Surveys or Questionnaires, and Interviews with users, experts or stakeholders. Online safety reporting tools or applications were also used in a third of the sample as a way to collect georeferenced data about women's safety in specific study areas. These studies either relied on already existing datasets of applications in operation (such as Safetipin), new data using already existing auditing tools or new data collected through platforms specifically designed for the research project and made available online for a limited amount of time. Each of these methods has its own benefits and drawbacks. Already existing data is the least flexible to accommodate the aims of new research but is the most robust in terms of the size and diversity of the data sample.

The selected guideline documents vary in terms of scale (global, regional and local) and the target users it is aimed for. While local guidelines are intended to provide planning tools suitable for particular contexts, global and regional guidelines offer

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guides that work for geographically proximal countries or countries with similar social, economic or political structures. The majority of the guidelines are aimed at Cities and target a wide range of urban actors spanning public, private and third-sector bodies interested in developing women and girl inclusive urban plans.

One of the research limitations of the guideline document review process is due to the limited number of documents in the review sample, and their wide diversity in terms of scope, approach and aims. The documents varied between urban planning and urban design guides, as well as guides of a specific nature designed to apply gender-sensitive views to existing urban plans and laws in certain territorial contexts. A step forward would be to expand the document sample (number of guidelines in review) while focusing on specific document objectives for deeper analysis.

The selection of case studies offers an overview of clear approaches tested in different contexts across a wide range of issues. The key issue that emerged is the complementarity of urban projects and urban initiatives. Urban and architectural design projects aim to provide spaces that are inclusive, particularly from a gender perspective, and is the result of a participatory design process involving girls and women. Urban initiatives on the other hand have an influence on the way the gender issue in public space is perceived and addressed beyond spatial conformation. They focus on increasing awareness on the issues and seek solutions to improve the existing state of affairs. Unlike urban projects, initiatives don't necessarily have a transformative approach but they are equally essential for the well-being of people and particularly overlooked minority groups currently occupying public spaces.

The technical document review also serves the purpose of highlighting the originality of the project by comparing its theoretical framework and methodological approach to previous works. This provides a solid foundation for further investigation, through a comprehensive analysis and synthesis of findings, emerging trends and technologies, filling knowledge gaps and advancing rigorous methodologies.

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CHAPTER 3

Data collection

3.1 Introduction

The Chapter 'Data Collection' focuses on the research activities undertaken in Work Package Three, with particular reference to the Task 3.1 'Location-based Open Data', the Task 3.2 'Wher App Data', and the Task 3.3 'Survey Questionnaires and Focus Groups'.

Women's safety on city streets is a complex and multifaceted issue that requires a deep understanding of the most significant indicators influencing such perceptions, one of the main challenges in tackling such a topic is the collection and selection of data. Institutions often show a lack of interest in gathering detailed information on safety issues specific to women, creating a gap in overall understanding. This indifferent attitude results in a lack of dedicated tools and resources, limiting the ability to fully comprehend the dynamics that generate urban safety factors.

Another significant challenge pertains to the absence of sector-specific data focusing exclusively on women's experiences. Generic data often does not allow for a detailed analysis of gender differences concerning specific aspects of the urban environment. This lack of sector-specific data limits the ability to formulate targeted policies and specific interventions that can effectively address safety issues affecting women.

In this context, the project aims to critically examine the challenges related to the collection and selection of data on urban safety for women, emphasizing the importance of addressing these gaps to develop more effective strategies for targeted user groups. Through in-depth analysis, the goal is to identify specific data that contribute to women's perceptions of safety in the city, thereby contributing to a more complete and accurate understanding of urban safety dynamics and improving walkability. With reference to the WP3, STEP UP aimed to fill the following gaps in research and practice:

- Data gaps: in the light of the poor availability of open-source data concerning the security perception of users in urban environments, the project aims to promote a replicable and scalable best practice by applying GIS-based methodology, location-based open data, and user-collected data to support policymakers. The suggestions and reports of the Wher App users represent

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a reliable and as yet unexplored database for investigating which urban and spatial characteristics affect women's perceived safety and, hence, turn this knowledge into take-aways for more inclusive cities;

– Replicable methodology: to promote a replicable and scalable methodology for local actors through the availability of an unexplored data set of the Wher App data.

3.1.1 A Digital Humanities Approach

Data collection in the framework of the STEP UP project follows a digital humanities approach, combining traditional and digital data collection and interpretative techniques to develop a transdisciplinary research at the intersection of computing, digital technologies and the disciplines of the humanities (Berry, 2011). This approach was deemed essential in the study of complex socio-spatial phenomena, such as the perception of safety of a specific demographic group, namely women.

The advent of digital technology has given rise to new research environments, offering new mediums for exploration using hybrid tools of data analysis that effectively mediate between new and conventional research mediums, and provides integrated and transdisciplinary methods for studying complex urban phenomena. Emerging digital technologies and data collection methods have significantly impacted the means of data production and interpretation, opening up numerous avenues for reading and understanding the urban experience through a user-centric approach (Zhang et al., 2024).

3.1.2 Data Collection Process

This chapter details the collection and validation process for a series of relevant datasets useful to carry out the analysis in the framework of the goals of the STEP UP project. Four different data types and tools were utilized in the research: *(i)* Location-based Open Data, *(ii)* Wher App Data, *(iii)* Survey Questionnaires, and *(iv)* Focus Groups. It is important to note that these four branches of the data collection process are not mutually exclusive but are often interlinked and combined to refine one another.

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Gender-disaggregated data sets collected through the four data groups were consequently analyzed through an extended GIS-based analysis and advanced statistical techniques, as well as a series of quantitative and qualitative analyses for non-locational data, aimed to support and enrich the mapping results with further evidence from women users of the city.

In an urban context, data management is crucial for understanding and optimizing the functioning of a city. Three main types of data that can be distinguished are: (*i*) Location-based Open Data; (*ii*) Location-based Proprietary Data; and (*iii*) Personal User Collected Data.

The location-based open data refers to publicly available information accessible to everyone, provided by the city itself or other open sources. Municipalities usually publish this information to promote transparency and accessibility of urban resources. Examples may include demographic data, weather conditions, public transportation, and more. In contrast, location-based proprietary data are information owned by the city or private entities. These data may involve sensitive information or internal operational details that are not made public for security, competition, or other reasons. Examples could include urban security plans, infrastructure monitoring data, or proprietary business information. The personal user collected data category refers to information collected by individuals, such as city residents or visitors, through personal devices or applications. These data can vary widely and may include personal preferences, feedback, GPS locations, and other user-generated data. Often, cities can leverage this data to personalize services, improve user experiences, or make decisions based on more detailed and contextualized information. Effective management and integration of these different types of data are crucial for developing sustainable city solutions and optimizing urban quality of life while ensuring the security and privacy of sensitive information.

3.2 Location-based Data

A series of relevant geolocated datasets were retrieved, sorted, validated, and filtered from open and proprietary data repositories and geoportals with the aim to populate a spatial regression model. The process detailed below shows the selection process

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of indicators leading to a final selection of eight indicators that were used to calibrate the Geographically Weighted Regression (GWR) Model to further analyze the relationship between said indicators and safety perception votes as observed through the Wher App.

3.2.1 Methodology

Proxy indicators were used to represent factors that are not directly observable among the list of safety factors identified as relevant in the literature in earlier phases of the STEP UP project (Variabile Proxy - Glossario Di Economia, Finanza, Borsa, n.d.). Within the framework of the STEP UP project, a total of 19 safety factors (SF_L2) were defined, classified into three types of safety factors (SF_L1): spatial features, city use and hotspots (Scarponi et al., 2023). A full list of these safety factors can be reviewed in the Annex I.

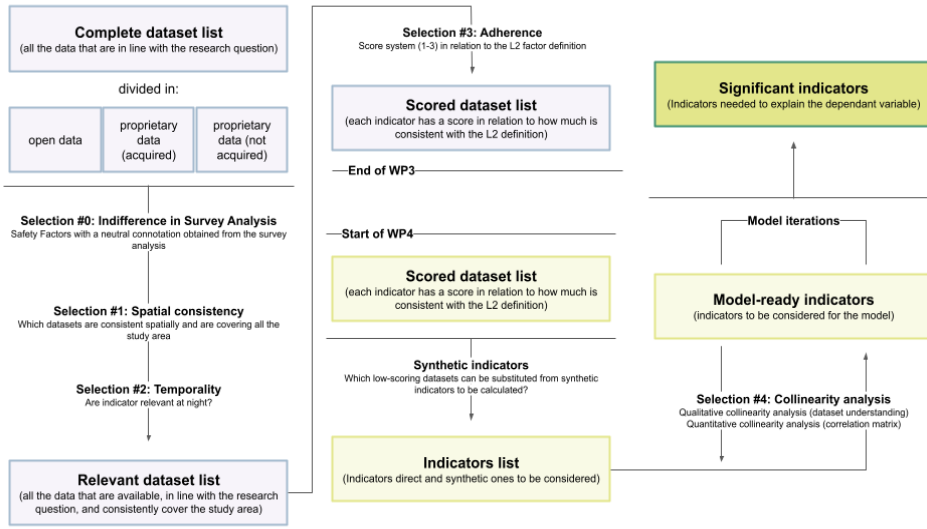

Figure 3-1 Data gathering and selection methodology

The set of proxy indicators identified in this research was cataloged and gathered by considering the following identified criteria: availability in the study area, alignment with the safety factors, reliability of the sources, sub-urban scale and spatial data. The complete dataset of proxy indicators was reduced further through a verifiable selection process (see Figure 3-1). This methodology consists of four selection

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phases. The first phase is based on the consistency criterion, the second on the temporality criterion, the third on the representativeness and alignment criteria in relation to the definition of safety factors in the research, and finally, a fourth phase, which in-volves an analysis of collinearity among the proxy indicators.

3.2.2 Proxy Indicators Definition

A proxy indicator is a statistical indicator that describes the behavior of a specific phenomenon that is not directly observable. In this study, proxy indicators have been used to represent the safety factors, listed in Table 3-1, identified in the literature and the premises of WP2 - Use cases definitions.

Safety Factors	Definition
L1 Space perception	Perception of space characteristics/morphological features
L1.1 Lighting	Presence, maintenance and features of lighting systems
L1.2 Openness	Ability to see and move in all directions
L1.3 Visibility “eyes on the street”	Possibility to be seen from shops, vendors and buildings
L1.4 Greenery	Presence of greenery as an obstacle and supplying hiding places
L1.5 Barriers	Physical impediments to free/ direct movements
L1.6 Security devices	Presence of emergency buttons and/or surveillance systems
L2 City Use	Perception of space characteristics/morphological features
L2.1 Crime rate	Reported crimes on streets related to assault, harassment, robbery
L2.2 Homeless or encampments	Presence of homeless groups and encampments
L2.3 Sex workers	Presence of sex workers / prostitution?
L2.4 Urban degradation	Carelessness of streets, sidewalks and public spaces (filth, tags, etc.)
L2.5 Presence of people	Social support or perception of anonymity and isolation
L3 Hotspots	Safe havens and no-go areas
L3.1 Transport hub	Transport infrastructures (subway stations, tram/ bus stops)
L3.2 Train stations	Presence of train stations
L3.3 Businesses	Presence and opening of commercial activities
L3.4 Public spaces	Squares and tactical urbanism interventions
L3.5 Spaces of gathering	Cultural, social, recreational, aggregation, educational centers
L3.6 Parks	Large urban green areas and parks > tot m2
L3.7 Open spaces	Large parking, dismissed/ abandoned areas
L3.8 Law enforcement units	Police stations/ patrols

Table 3-1 WP2 Use Cases Definition - Safety Factors

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3.2.3 Proxy Indicators Gathering

The sources consulted mostly concern open data, taken from the Geoportal of the Municipality of Milan[19], the Geoportal of the Metropolitan City of Milan[20], the Geoportal of the Lombardy Region[21], OpenStreetMap, ISTAT, and Strava. Of these data, there are some that are not open data for which the responsible institutions had to be contacted, in particular to the the Department of Mobility and the Department of Urban Regeneration of the Municipality of Milan.

- Geoportal Municipality of Milan: The Municipality of Milan identifies the Open Government paradigm as a way to create an open Public Administration that energizes innovation towards citizens and businesses: open data is one of the cornerstones of this strategy. The fundamental principle of open data is that public data, in compliance with current regulations, belongs to the community and as such must be reusable by anyone who has an interest in it (Portale Open Data | Comune Di Milano);
- Geoportal Metropolitan City of Milan: This site collects data in open format published by the Metropolitan City of Milan. These data are available on the regional portal dedicated to open data and on the national portal, which was renewed during the Open Data Week held in March 2017. The data owned by the Metropolitan City are made available under a Creative Commons Attribution 4.0 International license that allows everyone the possibility to freely reproduce, distribute, transmit and adapt the data, including for commercial purposes, provided the source is cited (Città Metropolitana di Milano);
- Geoportal of Lombardy Region: The Geoportal of Lombardy is a unified point of online access to the vast wealth of geographic information related to the territory of Lombardy. It offers tools for searching, visualizing, locating geographic data, converting to other reference systems, and downloading data (Ricerca - Geoportale Della Lombardia);

[19] See: https://geoportale.comune.milano.it/sit/
[20] See: https://www.cittametropolitana.mi.it/pianificazione_territoriale/sit/
[21] See: https://www.geoportale.regione.lombardia.it/

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- OpenStreetMap: OpenStreetMap (OSM) is a global collaborative project aimed at creating and distributing free and open geographic data. OSM users, known as "mappers," collect and record geographic information from around the world, including roads, buildings, trails, parks, points of interest and more. This data is then made freely available and can be used by anyone for a wide range of purposes (OpenStreetMap);
- ISTAT: ISTAT stands for Istituto Nazionale di Statistica, an Italian government agency responsible for producing and disseminating official statistical data about Italy. ISTAT collects, processes and publishes a wide range of statistical information on such topics as population, the economy, employment, education, health, the environment and many other aspects of Italian society. These statistical data are used for planning, research, public policy and analysis purposes in a variety of areas. ISTAT plays a key role in monitoring and providing accurate data on the country's socio-economic trends and demographic situation. The information collected by ISTAT is widely used by governments, institutions, businesses, researchers, and nongovernmental organizations to make informed decisions and conduct research on various aspects of Italian life. ISTAT is part of the European Statistical System and cooperates with other players in the international statistical system (Istat);
- Strava: Strava is a popular physical activity tracking and social networking Appaimed at sports and fitness enthusiasts. Strava users use the Appto record their sports activities, such as running, cycling, swimming, hiking and many others, using the GPS on their mobile device or compatible fitness devices. The Apprecords data such as distance traveled, time taken, pace, speed, altitude, and more. The main feature of Strava is the ability to share these activities with other users on the platform. Users can follow their friends, coaches or other athletes and see their activities, comment and like them. Strava encourages healthy competition among users through leaderboards and segments, which are specific routes where athletes can compare their times with others. Strava users in Milan can register and share

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their sports activities in the city, discover new routes, connect with other local athletes, and participate in challenges or events organized by the Strava community (Strava);

- Mobility Department of the Municipality of Milan: The Mobility Department of the City of Milan is a division within the municipal administration responsible for the management, planning and regulation of transportation and mobility within a specific geographic area. The main responsibilities of a Mobility Department in the city of Milan include transportation planning, regulation, and discipline, public transportation, sustainable mobility, traffic management, road safety, and sustainable development;
- Urban Regeneration Department of the Municipality of Milan: The Urban Regeneration Department of the City of Milan is the division of the local public administration in charge of developing and implementing policies and projects aimed at improving and transforming existing urban areas in order to make them more sustainable, attractive and functional. This type of assessment focuses on the redevelopment of neighborhoods, town centers, brownfields, or other urban areas requiring improvement. The main responsibilities of an Urban Regeneration Department may include urban planning, redevelopment and development, environmental sustainability, community involvement, economic development, and accessibility.

The set of proxy indicators (see Table 3-2) is cataloged and gathered by considering the following identified criteria: availability in the study area, alignment with the safety factors, reliability of the sources, sub-urban scale and spatial data.

SF_Level 1	SF_Level 2	Indicator	Typology	Year
Spatial Features	Lighting	Count of Public Lighting	Proprietary	2023
	Openness	Ability to see and move in all directions	Open	2012
	Visibility "eyes on the street"	Count of F&B	Proprietary	2023
		Count of Residential Buildings	Open	2012
		Count of Commercial Activities	Proprietary	2023
		Count of Kiosks on the Street	Open	2020

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SF_Level 1	SF_Level 2	Indicator	Typology	Year
	Obstructions to visibility	Count of Partition Elements	Open	2012
		Count of Isolated Trees	Proprietary	2020
		Length of Tunnels	Open	2020
		Length of Bridges	Open	2020
	Architectural Barriers	Average Distance from Crossings	Open	2023
	Security devices	Count of Security Devices	Proprietary	2023
City Use	Crime rate	Count of Reported Street Crimes	Proprietary	2023
	Homeless or encampments	Presence of Homeless groups and Encampments	Proprietary	2023
	Sex work/ workers	Presence of Sex Workers or the Activity of Sex Work	Proprietary	2023
	Urban degradation	Carelessness of Streets, Sidewalks and Public Spaces	Proprietary	2023
	Presence of people	Count of F&B	Proprietary	2023
		Density of Resident Population	Open	2021
		Density of Working Population (on selected Ateco codes)	Open	2011
		Wifi Hotspot Utilization	Open	2023
		Strava Metro Flows	Proprietary	2023
Hotspots	Transport hub	Count of Bus and Tram Stations	Open	2023
	Railway stations	Count of Railway Stations with External Buildings	Open	2023
		Count of Underground Trains Access Points	Open	2023
	Businesses	Count of F&B	Proprietary	2023
		Count of Commercial Activities	Proprietary	2023
	Public spaces	Count of Tactical Interventions or Pedestrian Spaces	Proprietary	2023
		Count of Urban Gardens	Open	2023
		Count of Urban Furniture	Open	2023
	Spaces of gathering	Count of Cultural Associations	Open	2020
		Count of Social Centres	Open	2022
		Count of Libraries	Open	2022
		Count of Leisure Centres	Open	2023
		Count of Sports Facilities	Open	2023
		Count of Equipped Areas	Open	2020

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SF_Level 1	SF_Level 2	Indicator	Typology	Year
		Count of Discos and NightClubs	Open	2023
	Parks	Count of Green Areas	Open	2012
	Open spaces	Count of Abandoned and not Activated Places	Open	2023
		Count of Industrial Buildings	Open	2023
	Law enforcement units	Count of Enforcement Presence	Open	2023

Table 3-2 Complete Dataset List

Availability in the study area

Data must be available in the country or area under study, either through open access or private sources. In this case, all data refers to the entire city of Milan. Open data are usually found on institutional portals; in the case under consideration, the sites of the Municipality of Milan, the metropolitan city and the Lombardy Region were consulted. The proprietary data, on the other hand, were requested from the Department of Mobility and the Department of Urban Regeneration and other relevant agencies.

Alignment with safety factors

The proxy indicators must accurately describe urban characteristics that influence women's perceptions of safety in the city of Milan, so it is important to choose data sets that conform to the given definition of safety factors.

Reliability of the source

The availability of data used within urban settings is not always assured, especially if complete and validated datasets are required. In this study, the search for proxy indicators took into account reliable sources and accurate datasets in order to ensure analyses and results that reflect reality.

Scale of Analysis

The data useful for calculating the indicators must relate to the chosen spatial unit of reference (e.g., census section, neighborhoods, streets, etc.), i.e., to a smaller scale so that they can be aggregated. In the study, the data are mostly point, linear and polygonal data located in the suburban area.

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Spatial Data Format

The data format must be compatible with that required by GIS spatial analysis software, this must be processable through the functions and processes provided by the program: raster data, vector data, alphanumeric data, etc..

3.2.4 Proxy indicators selection

After cataloging and collecting all available data, the complete dataset of proxy indicators was reduced through a selection process, shown in Figure 3-1. The methodology primarily consists of four selection phases. The first phase was based on the consistency criterion, the second on the temporality criterion, the third on the representativeness and alignment criteria with the definition of safety factors, and finally, a fourth phase, which will be addressed in Chapter 4, involved an analysis of collinearity to be conducted among the proxy indicators.

Selection Criteria

Identifying selection criteria can be a crucial step in reducing a set of indicators that describe urban characteristics more effectively and meaningfully. This process helps focus attention on more relevant indicators, thereby improving the quality and clarity of information.

Survey Analysis

The evaluative criteria are based on subjective and objective data. Indicators that emerge as significant from the results of surveys conducted directly with women in Milan should be given considerable weight in the selection. Women's responses about their perceptions of safety and the factors influencing those perceptions can guide the selection of the most relevant indicators.

Spatial Consistency

This criterion implies that the selected indicators should be measured consistently in different parts of the city or in representative samples. This helps to ensure that the data collected are comparable and that there are no discrepancies due to geographic variability.

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Temporality

Exclusive temporality refers to the fact that some indicators may only be relevant at certain times or times. The study focuses on the nighttime slot (i.e., *8:00 p.m. to 6:00 a.m.*), so all indicators that aren't active during those hours have been excluded (e.g., social centers, libraries, leisure centers, sports facilities, equipped areas, etc.).

Representativeness

This criterion is based on data and findings from previous research. The scientific literature can provide a comprehensive picture of urban factors that have been previously shown to be relevant to understanding women's perceptions of safety. Using existing literature as a guide for indicator selection can be useful to ensure that you are considering factors that are known to be influential.

Adherence to Safety Factors definition

It is essential that the indicators selected comply with the Level 2 of Safety Factors definitions. The final list of indicators, which belong to the spatial analysis model in the next phase of this project, are categorized and specified in descriptive sheets (see Table 3-3).

SF_Level 1	SF_Level 2	Indicators	Dataset Name
Spatial Features	Lighting	Count of Public Lighting	Public Lighting
	Openness	Ability to see and move in all directions	Roads Surface
	Visibility "eyes on the street"	Count of F&B	Food and Beverage Services
			Integrated Food and Beverage Services
		Count of Residential Buildings	Residential Buildings
	Obstructions to visibility	Count of Partition Elements	Partition Elements
		Count of Isolated Trees	Trees
	Architectural Barriers	Length of Tunnels	Tunnels
		Length of Bridges	Bridges
		Average Distance from Crossings	Highways
	Security devices	Count of Security Devices	SOS Devices

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SF_Level 1	SF_Level 2	Indicators	Dataset Name
City Use	Presence of people	Density of Resident Population	Resident Population
		Density of Working Population (on selected Ateco codes)	Worker Population
		Count of F&B	Food and Beverage Services
			Integrated Food and Beverage Services
		Strava Metro Flows	Yearly Night Strava Users Flow
Hotspots	Transport hub (bus stop/ tram stop)	Count of Bus and Tram Stations	Surface Public Transport Stops
	Railway stations	Count of Railway Stations with External Buildings	Railway Station Buildings
	Businesses	Count of F&B	Food and Beverage Services
			Integrated Food and Beverage Services
	Spaces of gathering	Count of Discos and NightClubs	Discos and Nightclubs
	Parks	Count of Green Areas	Green Areas
	Open spaces	Count of Abandoned and not Activated Places	Abandoned Buildings
			Areas of degradation
			Parking Lots With Area > 250sqm
		Count of Industrial Buildings	Industrial Buildings
	Law enforcement units	Count of Enforcement Presence	Police Headquarters

Table 3-3: Scored Dataset List

3.3 Wher App data

Data regarding the perceived level of security of women while walking was collected through 'Wher', a route planner application operated by Walk21 Foundation. Wher is an effective tool for collecting geo-localized data about women's perceived level of security while walking in urban areas (Carpentieri et al, 2023). It is a crowd-sourced mapping tool allowing women in a particular city or area to rank geo-referenced locations according to their perceived level of safety. The Wher App was founded in 2016 and has been active since 2018 (Lorenzini, 2018) and at the time of 1st of April 2019 in Milan it counted 7,844 users and 1,296 reporters. The Appcollected 5,667

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ratings, including 3,850 textual ratings. Over 50% of the city extension (in kilometers) was evaluated.

3.3.1 Methodology

The methodology for studying data from the Wher App involved two main approaches: analysis of the corpus of textual comments and analysis of Wher punctual data for integration in a GIS model.

Figure 3-2 Wher App data - Comments Word Cloud

In the comments analysis, textual data was carried out through textometric analysis using the IRAMUTEQ software for uncovering patterns and themes, followed by a sentiment analysis using Kimola software to derive sentiment classifications and identify frequently occurring terms (see Figure 3-2). The most frequently occurring terms are either related to the description of the environment and timeframe such as "road" (in italian "strada"), "neighborhood" (in italian "zona"), "residential" (in italian "residenziale), "evening" (in italian "sera"), "night" (in italian "notte") and "day" (in italian "giorno"); or they are related to a perceived sentiment or warning, for example "be careful" (in italian "attenzione") or "calm" (in italian "tranquilla"). For the Wher punctual data analysis, a road graph was created using OpenStreetMap

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and joined to the punctual Wher App data to visualize ratings distribution and identify areas with the highest number of ratings, providing insights into the spatial distribution of user perceptions.

3.3.2 Data distribution

The analysis presented on geo-localized data about perceptions of safety was carried out on the scale of NILs (Nuclei d'Identità Locale), which are areas that can be defined as neighborhoods in Milan, with homogeneous characteristics, varying from historical reasons, infrastructure, mobility services and presence of public green spaces. The distribution of the 3850 textual user ratings is shown in Figure 3-3.

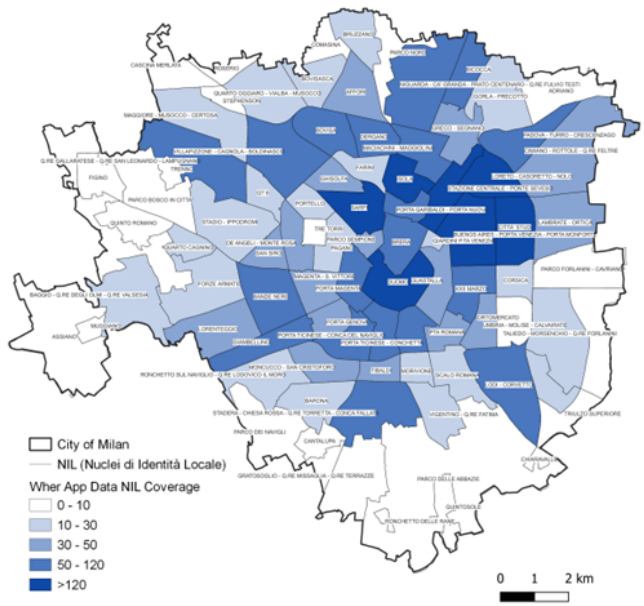

Figure 3-3 All Wher App data - NIL Coverage

The areas with more than 150 ratings, i.e., the areas most covered by assessments, are concentrated around the Duomo, Isola area, Buenos Aires area, Porta Venezia, and Porta Monforte, these are considered central areas and fall within the central and semi-central OMI zones, identified by the Italian Internal Revenue Service, Agenzia delle Entrate, as shown in Figure 3-3. The Osservatorio del Mercato Immobiliare (OMI), a real estate market observatory, is responsible for collecting and

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processing technical and economic information on property values, the rental market and annuity rates, and for publishing studies and calculations and making statistical use of the archives of the Agenzia delle Entrate (Schede - Osservatorio Del Mercato Immobiliare - Quotazioni Immobiliari - Agenzia Delle Entrate, n.d.).

Wher Road Graph

The Wher App dataset is structured as single ratings, with the information regarding the creator of the comment and the timeslot of the day. Each score is positioned by the user on the geometric barycentre of the arc forming the road graph from OSM (OpenStreetMap), so the geometric consistency of the dataset is a set of points.

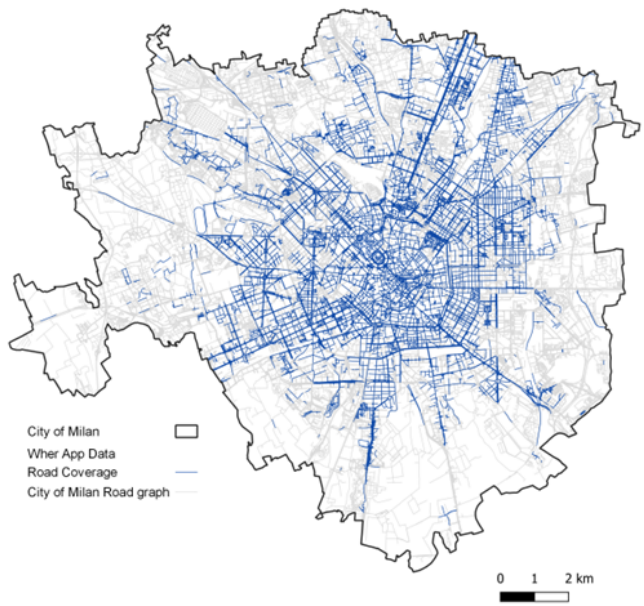

Figure 3-4 Wher App data - Road Coverage

The same rating can be attributed to more than one point on the map, giving the user the chance to select a larger area with the same security perception characteristics, by including similar street segments considered similar to the main one. This divides the ratings in two typologies, the ratings associated with a single point on the map and the ratings associated with more than one point on the map (indicating an area that can vary). Figure 3-4 shows the general coverage of the data

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on the road graph, while this represents just the coverage, it is worth mentioning that most street segments are characterized by more than one comment or rating.

User Ratings and App Rating Procedure

The App first asks to verify one's account by linking it with a verified Facebook page and asks for personal information. "Wherrior" users then have to report optional personal ratings and comments to review a selected stretch of road on the App's map. They are asked to: (i) select a time slot between day, twilight and night; (ii) rate the lighting from "Not at all" to "A lot"; (iii) specify the level of crowding from "Deserted" to "Very crowded"; and (iv) select advisability, with respect to perceived safety (Avoid, be careful and go easy). The ratings are provided with geolocation and time reference (date and time of transcription) and the points are distributed as illustrated in Figure 3-5. They summarize all the information of the users and their complete ratings. Through the App, the users specified their biographical information, which allows to have segmented information about both city users and the residential population. Each data point includes the following information: (i) user ID; (ii) creation time; (iii) birthday; (iv) city; (v) occupation; (vi) transport; (vii) mapped meters; (viii) ratings; (ix) vote on perception; (x) vote on light; (xi) vote on crowd; (xii) timeslots; (xiii) rating data; (xiv) longitude; and (xv) latitude. In particular, the analysis summaries on user data, occupation, age and distribution of ratings over time, are shown in Figures 3-6. In particular, the results analysis of User ID Information showed: No. 1567 users in total; No. 3954 ratings in total; No. 2.5 rating per user on average; and No. 1.56 NIL per user on average. The ratings collected through the Wher App refer to 3 time slots: day, evening, and night, 06:00 - 20:00, 20:00 - 24:00, and 24:00 - 06:00, respectively. For each time slot, the level of safety perception is distributed as shown in Figure 3-7.

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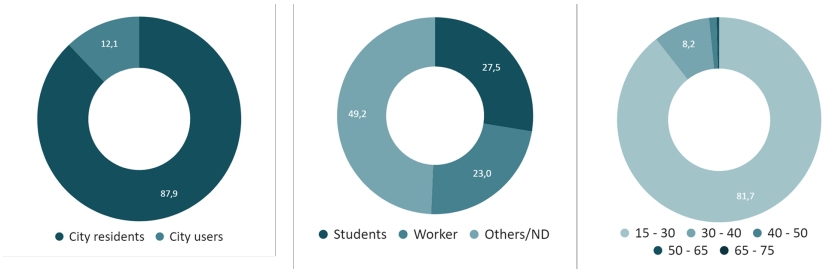


Figure 3-5 Wher App City Users, Occupation, Age

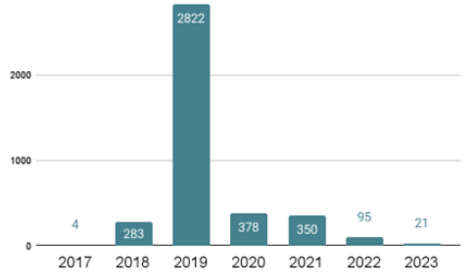
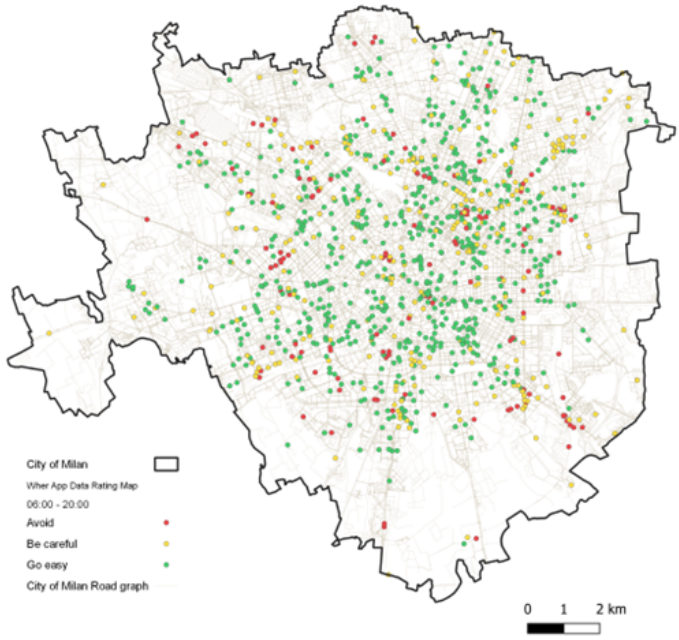


Figure 3-6 Distribution of Wher Data over time



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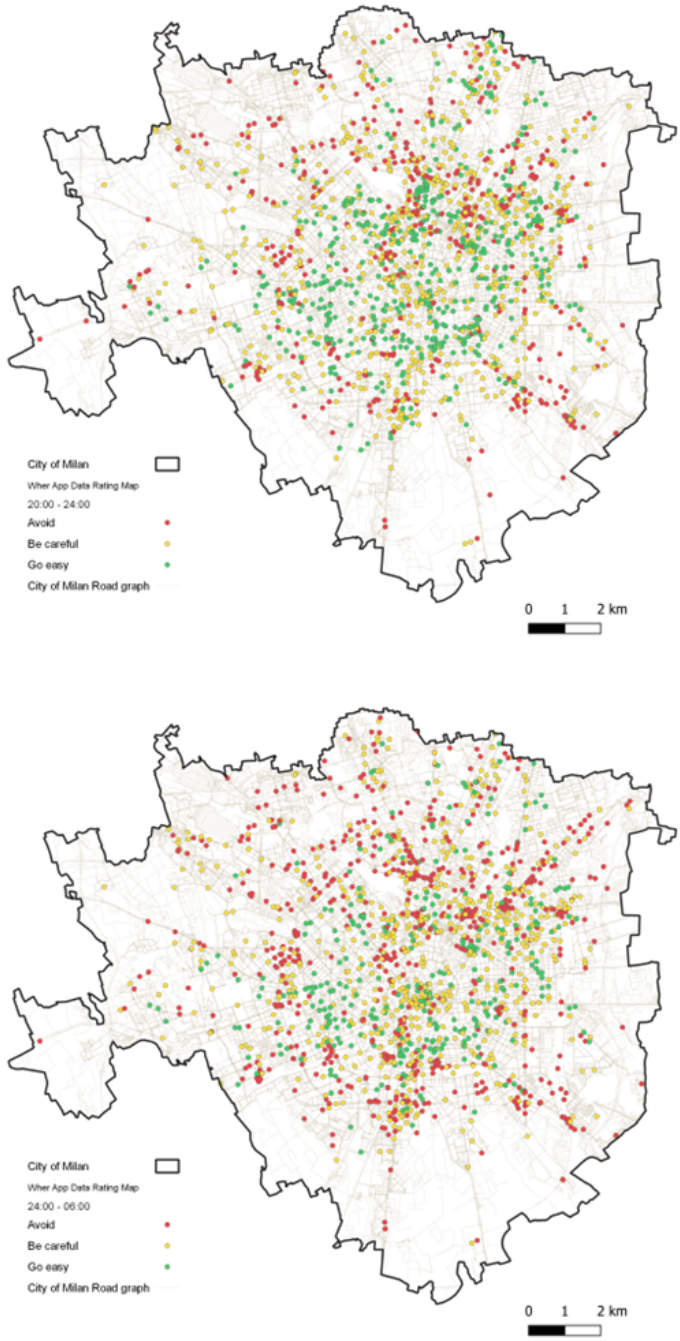

Figure 3-7 Wher comment distribution in day (top), evening (middle) and nighttime (bottom)

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3.3.3 Wher Data Analysis for GIS Model

The dataset available in the city of Milan consists of data going from 2018 to 2023, the majority from the year 2019, with a coverage of the road graph of over 50% of rated roads.

Considering the availability of data and the direction of interest of the project, the Wher App dataset submitted to further analysis is the data relative to the timeslots of evening and night (from 8:00pm to 6:00 am) and from the year 2019, as the earlier data is limited and the intention is to avoid any possible variation due to the Covid-19 pandemic.

Furthermore, to better describe the target of the project, only the ratings present within the Municipality of Milan are taken into consideration in the following analysis of the dataset.

The Wher Road Graph Map

A road graph was created by downloading the OpenStreetMap graph and eliminating the categories not relevant to pedestrian flow. The goal was to join the punctual Wher App dataset to the graph. Whilst the categories of arcs interested by traffic flows worked well, as the graph was intersected at each vertex, it was necessary to split the arcs of sidewalks to a maximum length of 100 meters, to be able to represent the Wher Data accurately.

The process of joining the graph to the punctual Wher App data produced a graph containing the univocal information of each rating composed by the ID of the user and the time and date of said rating and the univocal information of each arc of the graph. This means a graph with overlapping arcs in number equal to the amount of ratings that were produced for each arc. From this information it's possible to obtain two different images, the first based on the ID of each rating (ID of the user + time and date of said rating), the second based on the ID of each arc of the graph. The map at Figure 3-8 shows the distribution of the ratings on the city of Milan, with the overlapping of different votes and ratings of different dimensions. As previously stated, the ratings go from a vote of 1 to 3 and aren't necessarily only indicating one point, they can also indicate multiple points.

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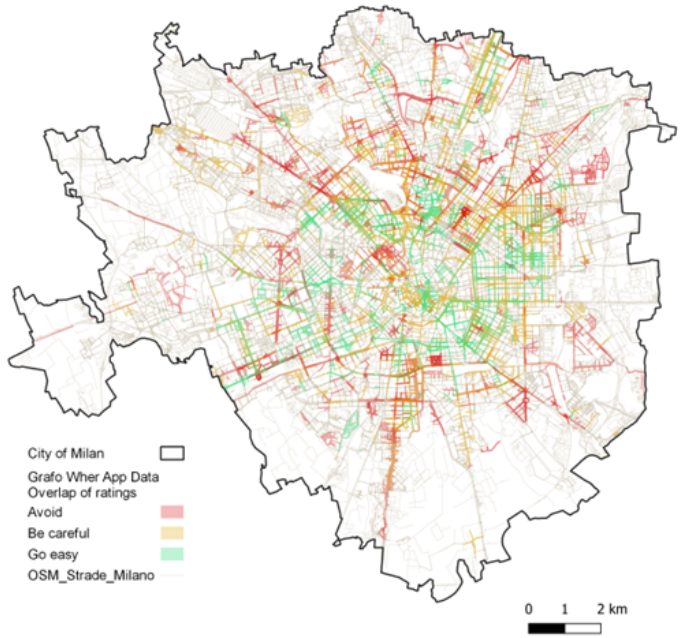

Figure 3-8 Wher App Data 2019 - Map showing overlap of ratings for each arc

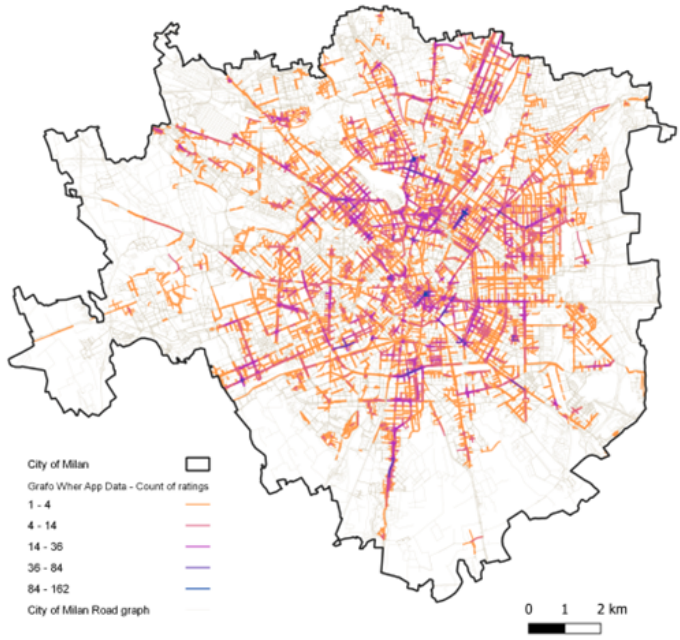

Figure 3-9 Wher App Data 2019 - Map showing the count of ratings for each arc

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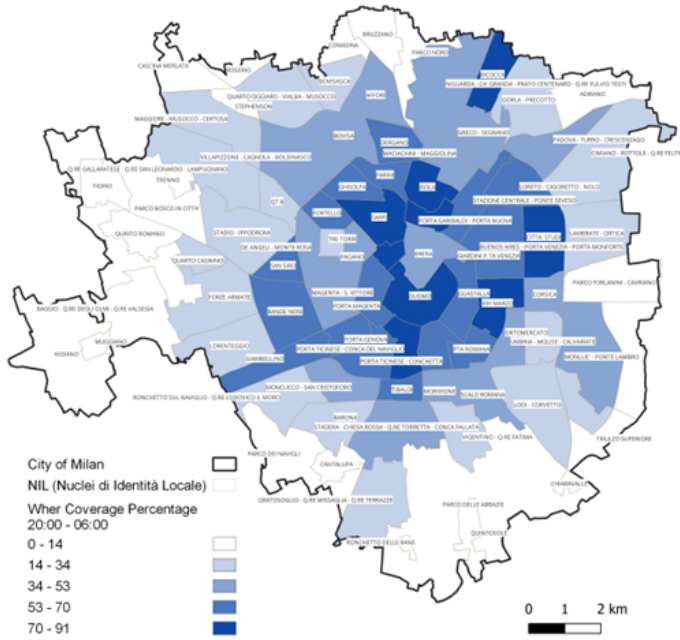

Figure 3-10 Wher App Data Coverage Percentage 20:00-06:00

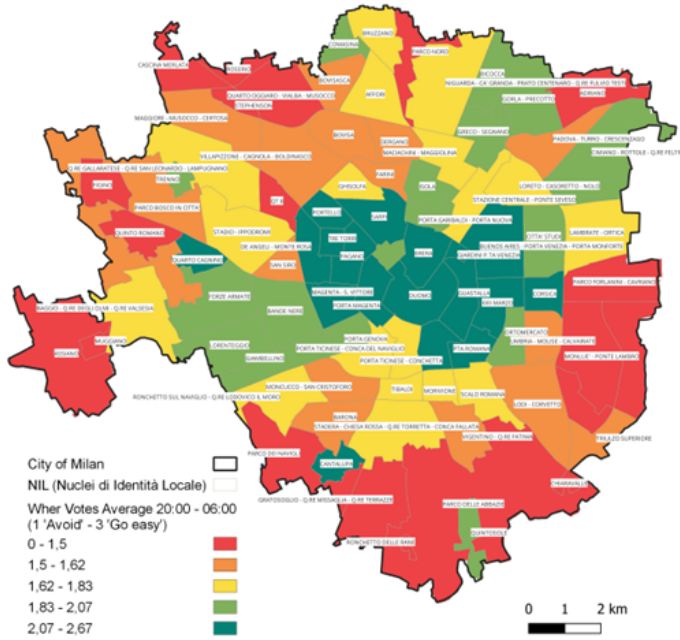

Figure 3-11 Wher App Data Votes Average 20:00-06:01

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By selecting multiple points, the user is actually indicating an area with the same vote of safety perception. This is visible in the image as some ratings appear as very small blobs, some appear as large areas sometimes encompassing more than one NIL. Within this image it is also possible to see the overlapping of votes: some areas are characterized by similar votes, resulting in a strong red or a strong green, whereas some areas are characterized by the overlapping of different votes meaning those areas are perceived differently by different users.
In this representation it is in fact possible to identify which areas have been rated the most, going from a minimum of one rating to a maximum of over 160 ratings.
After the detailed analysis of the graph, further analysis was done by grouping the data on the NILs of Milan (i.e. Nuclei d'Identità Locale, neighborhoods of Milan).
The following map (Figure 3-10) shows the percentage of data coverage for each NIL, obtained by dividing the length of the graph characterized by at least one Wher App rating by the total length of the graph present in each NIL. Whilst the last map (Figure 3-11) shows the average of the votes on the perceived safety of the total of ratings for each NIL.

Textual Comments Analysis

Textometric analysis, also known as textual analysis or text mining, is a methodology used in the field of computational linguistics and natural language processing (NLP) to analyze and extract meaningful information from large bodies of text. The goal of textometric analysis is to uncover patterns, trends, and insights within textual data. (Carpentieri et al., 2023) In this research work was used an open-source software tool designed for textometric analysis, IRAMUTEQ[22], which stands for Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires (Interface of R for Multidimensional Text and Questionnaire Analysis). IRAMUTEQ can be a powerful tool for qualitative text analysis, helping to uncover valuable insights from women's ratings on Wher App. Additionally, consider combining textual analysis with

[22] Iramuteq — IRaMuTeQ. (n.d.). Iramuteq - IRaMuTeQ. Retrieved December 15th, 2023. See: http://www.iramuteq.org

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other quantitative or qualitative research methods to understand the topic comprehensively.

Here are the steps for analyzing the ratings left by Wher users:

- Data Collection: Start by collecting the ratings that Wher users have provided regarding their experiences with security perception in the app;
- Data Preprocessing:
  - Clean the text data: Any irrelevant information has been removed, such as special characters, numbers, and formatting;
  - Tokenization: The text is split into 4 individual classes, regarding the user vote on perception. Each class is represented by a different color as shown in Figure 3-12;
  - Stopword removal: Common words (e.g., "the," "and," "in"), that do not carry significant meaning, have been removed;
  - Stemming or lemmatization: Words have been reduced to their root forms to improve analysis accuracy.

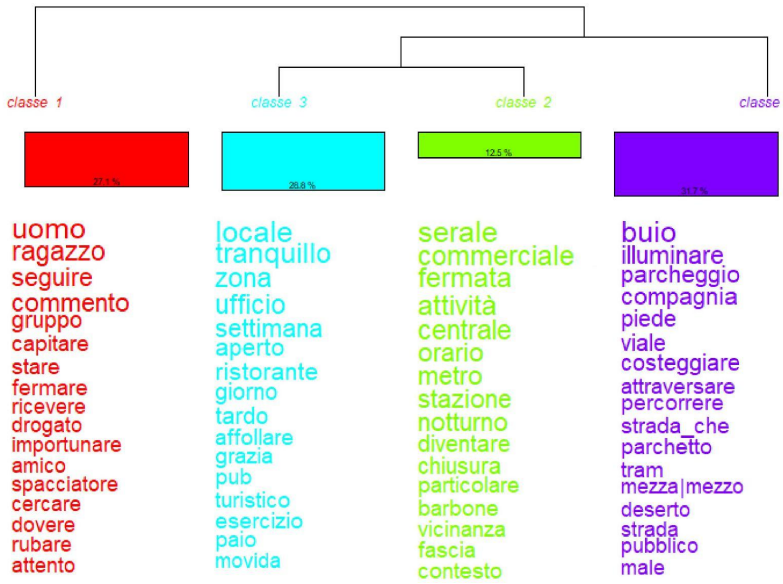

Figure 3-12 Textometric Analysis Word Classifications, there are four obtained groups, for each group here are the most recurring three words: uomo (man), ragazzo (young man), seguire (to follow); locale (local), tranquillo (quiet and peaceful), zona (area); serale (evening), commerciale (commercial), fermata (stop); buio (dark), illuminare (to light up), parcheggio (parking).

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- Text Exploration: The dataset has been explored to get an overview of the ratings and the frequency of the words and identify any immediate patterns, classifications or themes;
- Word Clouds: Word cloud has been created to visualize the most frequently mentioned words in the ratings. This could give an initial sense of the main topics;
- Text Clustering and Analysis: IRAMUTEQ used various statistical techniques for text analysis, including Principal Component Analysis (PCA), Multiple Correspondence Analysis (MCA), and Hierarchical Cluster Analysis (HCA);
- Visualization: These techniques have been used to cluster and group similar ratings or themes within the dataset. This helped in identifying commonalities and differences in women's experiences with walkability and security perception. Figure 3-13 shows a factor analysis corresponding to the increasing frequency of forms and lemmas. Factor 1 and Factor 2 present the values and percentages of each class.

Form	Frequency	Part-of-speech
zona (urban area)	910	nom
strada (street)	896	nom
tranquillo (quiet, peaceful)	845	adj
sera (evening)	681	nom
attenzione (attention)	681	nom
notte (night)	599	nom
via (road)	547	nom
giorno (day)	540	nom
frequentare (to frequent)	445	ver
passare (to pass by)	386	ver
illuminare (to light up)	370	ver
evitare (to avoid)	352	ver
deserto (deserted)	317	adj

Table 3-3 Textometric Analysis Frequency Analysis (Frequency>300)

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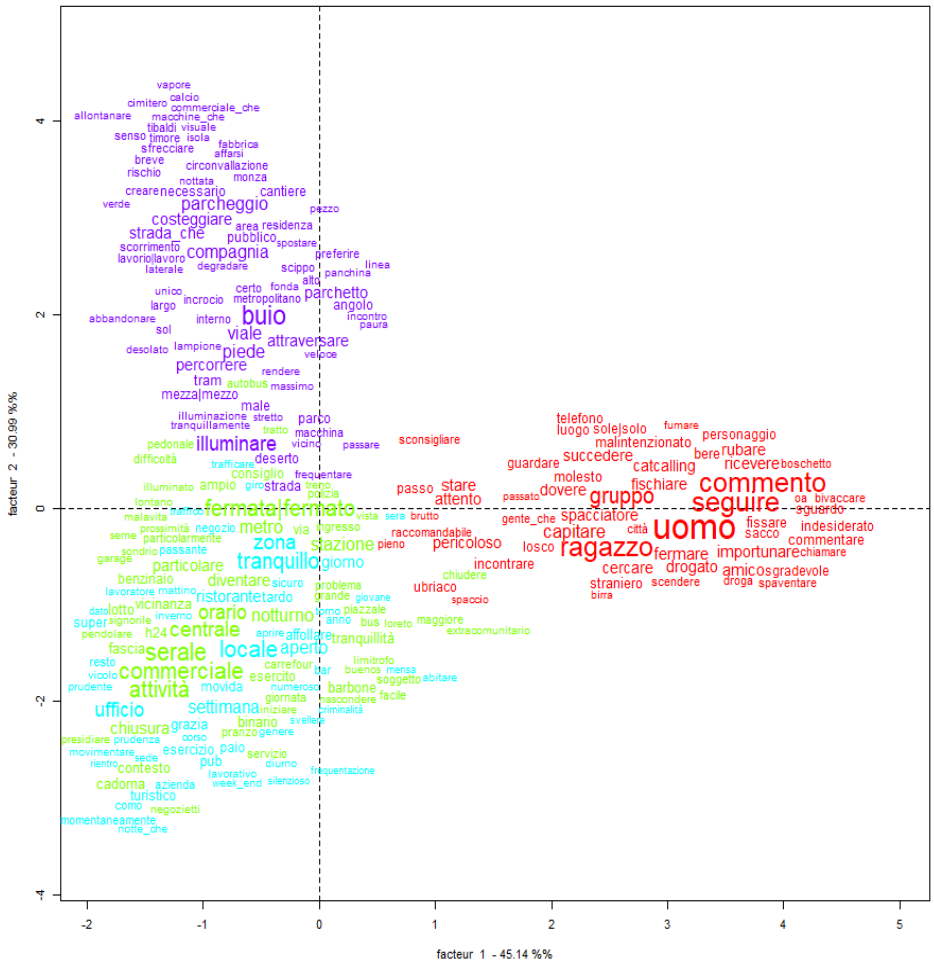

Figure 3-13 Textometric Analysis Word Classifications, there are four obtained groups, for each group here are the most recurring three words: uomo (man), ragazzo (young man), seguire (to follow); locale (local), tranquillo (quiet and peaceful), zona (area); serale (evening), commerciale (commercial), fermata (stop); buio (dark), illuminare (to light up), parcheggio (parking).

Through IRAMUTEQ's visualization tools the findings have been represented graphically. These include dendrogram plots for clustering results as shown in Figure 3-12, word clouds for thematic analysis, or correspondence analysis plots to show relationships between variables. Through IRAMUTEQ's visualization tools the findings have been represented graphically. This includes dendrogram plots for clustering results, word clouds for thematic analysis, or correspondence analysis plots to show relationships between variables.

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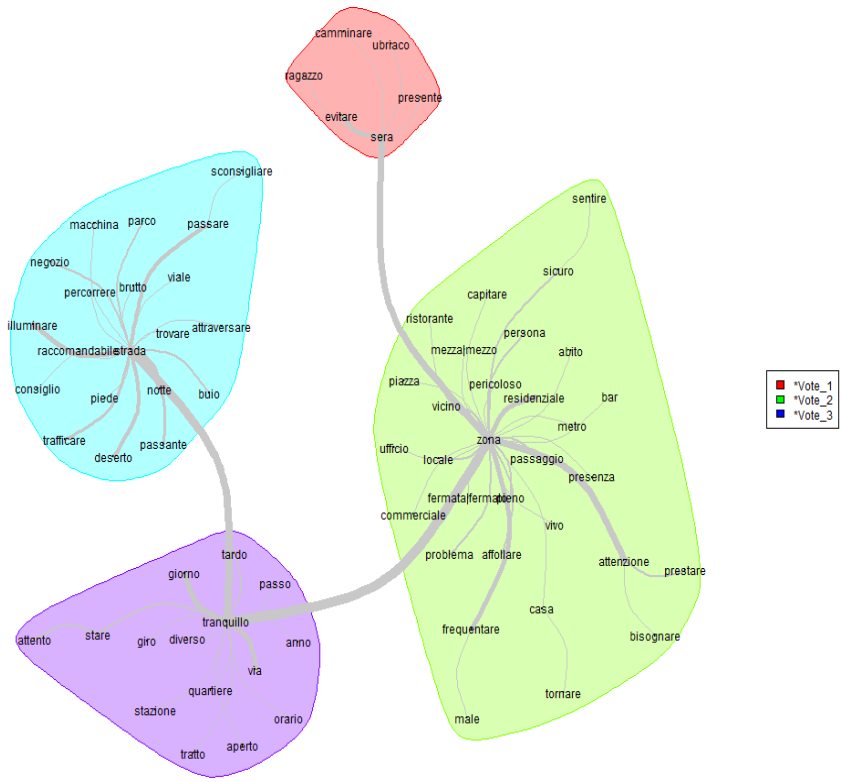

Figure 3-14 Textometric Analysis Word graph, the four groups are linked by recurring words, such as zona (urban area), tranquillo (quiet and peaceful), sera (evening) and strada (street).

3.3.4 Sentiment Analysis

Sentiment analysis describes the field of study concerned with analyzing the opinions, attitudes and emotions of individuals towards entities such as products, services, organizations, locations and events (Liu, 2012).

Over the last two decades, the field has become increasingly active given the vast real-world applications to a plethora of disciplines, such as politics, economics, business, healthcare and urban planning.

Increased engagement with sentiment analysis has also coincided with the rapid growth in social networks, without which a lot of the recent research would not have been possible. For the first time in human history researchers have access to huge

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volumes of freely accessible data published by individuals online (Roberts et al., 2018). In this project a sentiment analysis was conducted using Kimola[23].

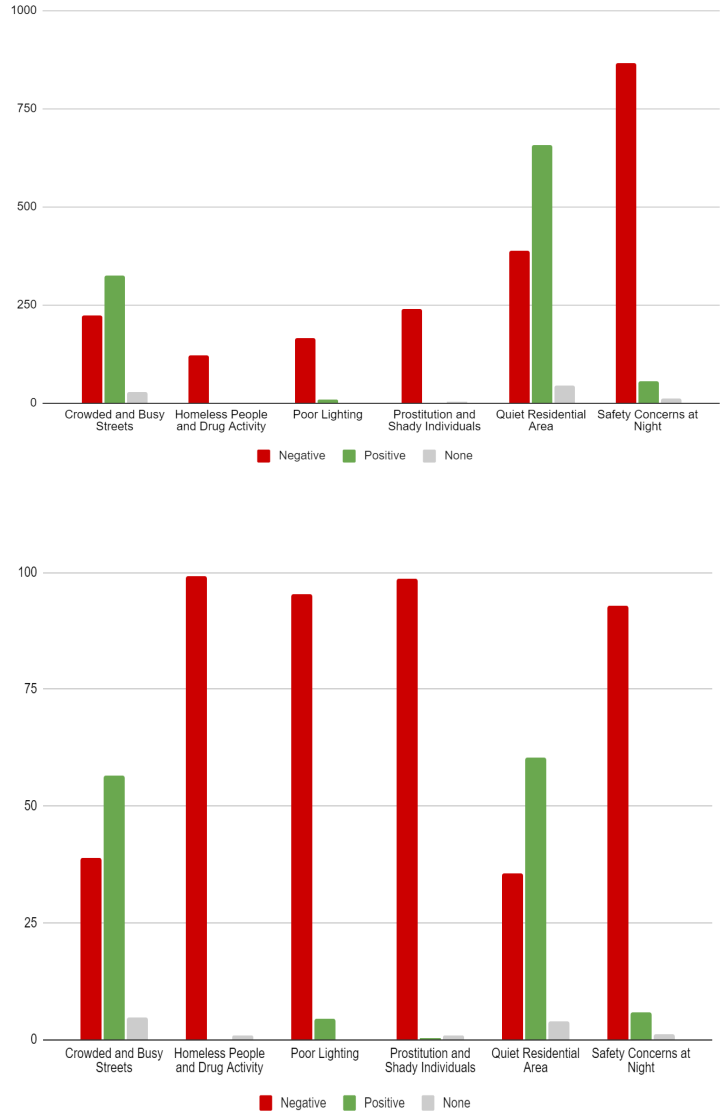

Figure 3-15 Sentiment Analysis classification count (top), Sentiment Analysis classification percentage (bottom)

[23] Kimola, Inc. Kimola Cognitive: Artificial Intelligence platform for Researchers. (n.d.). Kimola. Retrieved December 15th, 2023. See: https://kimola.com/cognitive

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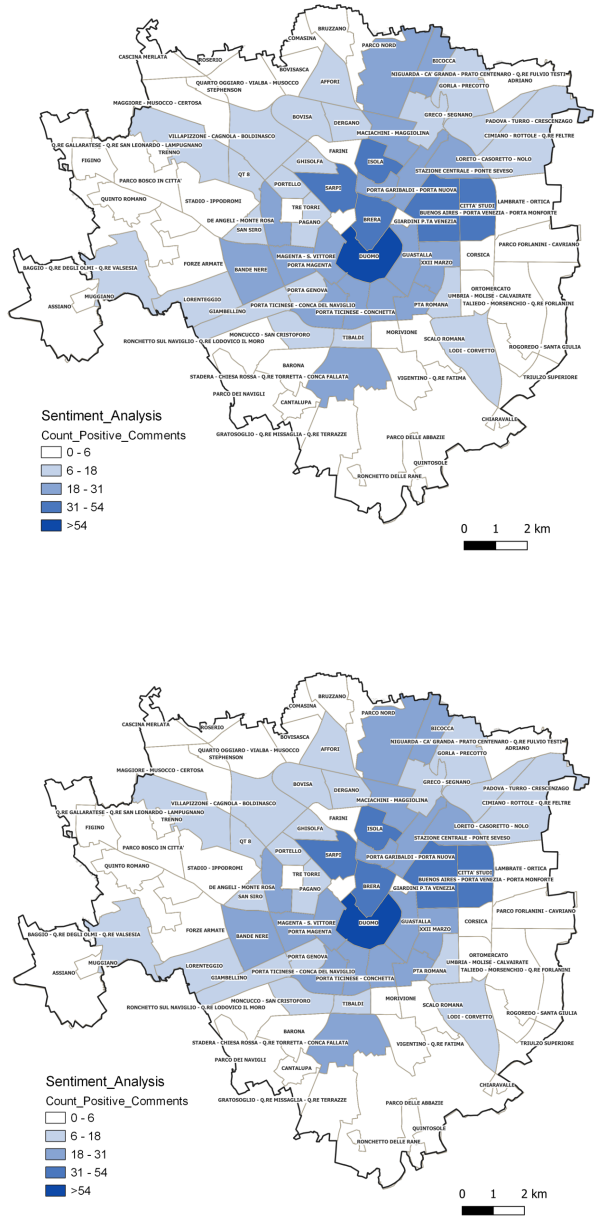

Figure 3-16 Sentiment Analysis - Count Positive Comments (top), Sentiment Analysis - Count Negative Comments (bottom)

Kimola is a platform dedicated to social research and machine learning, primarily designed for obtaining consumer insights and enhancing marketing strategies. It operates exclusively with English texts. Utilizing Kimola involves the submission of an

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Excel file containing ratings, enabling the derivation of sentiment classifications and the identification of frequently occurring terms.

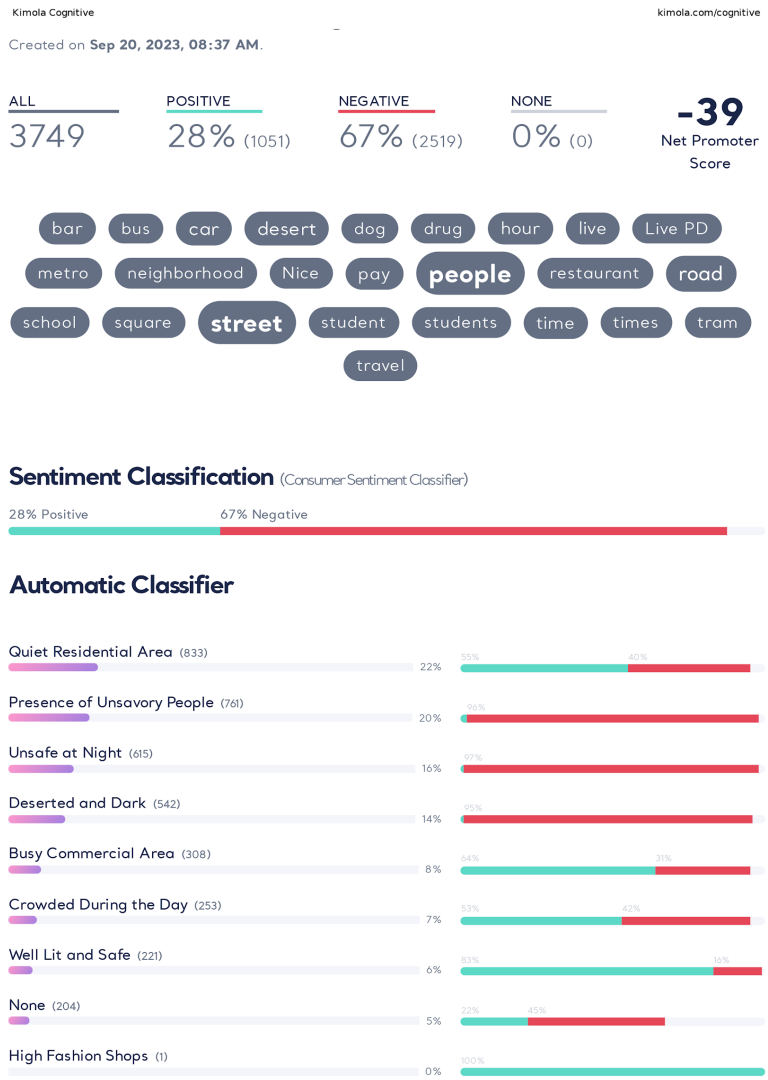

Figure 3-17 Kimola - Sentiment Analysis Summary Report

In this research work automatic classifiers are generated, grounded in prevalent comment themes, with associated Sentiment Classifications: (i) crowded and busy streets; (ii) homeless people; (iii) drug activity; (iv) poor lighting; (v) sex workers or the activity of sex work; (vi) quiet residential areas; and (vii) safety concerns at night.

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This facilitates the determination of whether a positive or negative sentiment is linked to each classifier (see Figure 3-15 and Figure 3-16). Furthermore, through word selection, it is possible to ascertain the frequency of word usage, its sentiment polarity (positive or negative), and its respective category. The option to select multiple words allows for comment filtering, offering insights into result variations based on different word combinations. Ultimately, Kimola enables the generation of a downloadable summary report containing comment classifications and sentiment evaluations (see Figure 3-17).

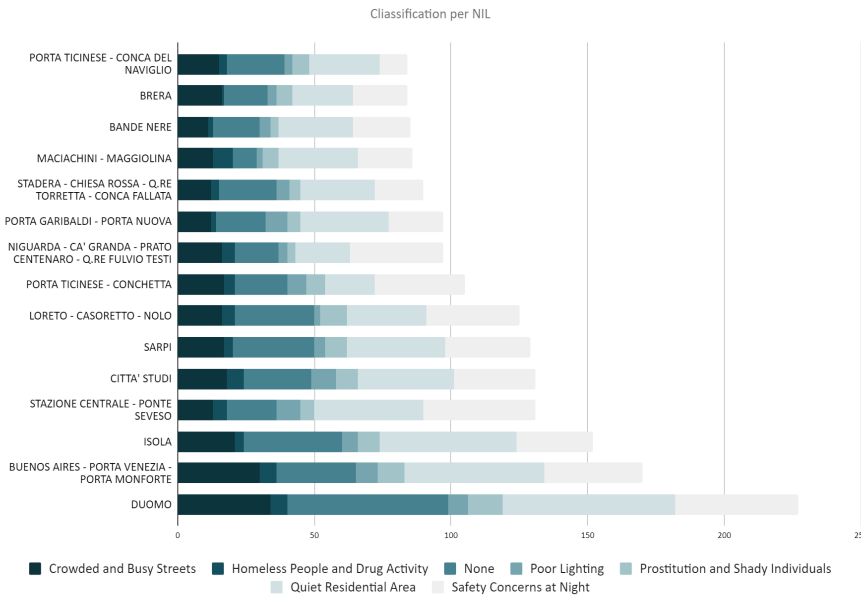

Figure 3-18 Sentiment Analysis NIL Classification

In conclusion, leveraging sentiment analysis results makes it possible to assess the negativity and positivity associated with each topic, enabling the provision of geo-localized insights into comments (see Figure 3-18).

3.4 Survey questionnaires

The survey questionnaires were part of Task 3.3 which includes data collected through an open survey and focus group discussions. The survey was designed to

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intercept the participants' priorities of interest regarding daily life in public space, in particular in relation to safety while walking, both in relation to the predetermined safety factors identified in WP2 as well as openly through the collection of open-ended responses. A full version of the survey form is included in the Annex (see Annex VII).

The survey aimed to enrich the data collected through Task 3.2, and fill in gaps in the Wher data about women's perceptions of safety, in particular in relation to: (*i*) familiarity with the city, elaborated through the collection of data on relation to the city (resident, visitor) and mobility patterns of each respondent in the city; and (*ii*) intersectional differences between respondents as elaborated through an extensive demographic data section enabling the study of the survey participants' responses against a number of their identity dimensions. The use of surveys as a data collection method for intersectional analysis has been highlighted in previous research (Fernandez et al., 2016; Hughes et al., 2022; Safer Parks Consortium, 2023). As such, the survey questionnaire was designed with three broad aims in mind:

- To determine the weight of each safety factor identified in WP2 based on the explicit perception of women and gender minorities who are familiar with the city of Milan and regularly walk there, in particular at night;
- To enable an intersectional approach to the analysis of women and gender minorities' perceptions of safety while walking in Milan, highlighting differences between different axes of identity;
- To support the selection of focus areas across the city, in combination with Wher data collected in Task 3.2, in which to carry out Focus Group Discussions for deeper understanding of positive and negative perceptions of safety in specific neighborhoods.

3.4.1 Methodology

Survey type

The survey was designed as a diagnostic and comparative survey combining quantitative and qualitative questions to understand the relationship between user profiles, mobility patterns and their perceptions of safety in the city.

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- Format: 15-minute online survey designed using Google Forms[24];
- Language: Two versions of the survey were produced and disseminated across various channels, one in Italian (the local language) and another in English, with the aim to expand the respondent base to non-Italian-speaking and non-Italian-fluent populations in the city of Milan;
- Timeline: The online survey was kept active for a duration of 4 months, between 03/07/2023 and 31/10/2023;
- Pilot testing: The survey structure was validated through a workshop session organized by the STEP UP team on the 8th of June 2023 in Milan, as part of the Milano Arch Week program. The workshop had a duration of over two hours and involved the participation of around ten participants, who reviewed the safety factors through the completion of the survey with the aim to confirm the relevance of the safety factors as well as the readability and comprehension of the survey itself;
- Sample size: The survey aimed to gather at least 500 responses from users of the city of Milan. The actual number of responses collected by the end of the dissemination period was 1808 responses (Italian version: 1762, English version: 46);
- Dissemination strategy: The survey was disseminated primarily through the consortium members' social media channels as well as by email to their extended networks, targeting active NGOs and community groups in the city of Milan as well as academic networks and Universities. The aim of the dissemination approach was to ensure sample representativeness by purposefully reaching out to underrepresented and vulnerable groups such as migrant or international communities, queer communities and disabled persons as well as overcoming bias in respondents' profiles with respect to gender (underrepresentation of men) and age (underrepresentation of older age groups);

[24] See: https://www.google.it/intl/it/forms/about/

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- Ethical considerations: The data collected through the survey was processed in accordance with the GDPR - General Data Protection Regulation (EU, 2016/679). All data has been treated confidentially and analyzed in accordance with the provisions of current regulations including the guarantee of anonymized results.

Survey Structure

The survey was designed as a diagnostic survey, aimed at understanding the complex relationship between gender and experiences of safety and unsafety in public space, while walking in the city of Milan. The structure of the different survey questionnaire components varied depending on the depth and complexity of the information needed to study the situation, including questions of both quantitative and qualitative nature. In sum, the questionnaire was designed into three main sections:

- "Walkability in Milan profile" of each respondent (mobility data and general perception of safety in the city of Milan);
- Relevance of each safety factor, focus on specific areas safe/ unsafe and focus on sexual harassment/violence (data on experiences of safety/unsafety in public space);
- Demographic information/ intersectional approach (demographic data).

In order to validate the weights of the safety factors, a Likert scale was used to evaluate each safety factor individually through a dedicated section in the survey (question 13-39). These questions were focused on nighttime significance, which is the core theme of this research. Daytime significance was also considered in this section of the survey (question 40) in order to compare the relevance of each safety factor during the day. However, this was done using a simple multiple-choice approach, by setting the negative connotation in the question, the result focuses only on the relevance of each factor without taking into consideration the weight of the relevance.

Aware of the impossibility of asking people to report specific locations due to the limitations of the tool used to build the survey, we chose to ask respondents to report places perceived as safe and unsafe in an open form, and then to analyze the answers

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with other artificial intelligence tools useful for synthesizing and translating the answers. Among the open-ended responses, we considered it interesting to question the participants with respect to the specific factors that, in their words, contribute to making the places reported as safe or unsafe, and to report, always in complete freedom, what strategies they put into action when they walk down the street and feel unsafe. These methodological choices, combined with the closed answers on the factors, gave the possibility of expanding the answers with factors and strategies not included in the closed answers. The approach pursued in the realization of the survey was based on the desire to have an intersectional view, capable of intercepting different experiences given by the different demographic characteristics of the respondents. For this reason, the demographic survey section is very extensive. Demographic data collected focused on aspects relating to age, sex, gender, sexual orientation, membership to religious communities, citizenship, physical and cultural ethnicity, and disability. Some of these aspects were further investigated, asking for specifics, and the response to each of these categories was always kept optional. One aspect that we considered important was the physical bodily appearance of the respondents, in relation to how they are perceived in public space and the type of discrimination they might be subjected to, if any, or even the type of specific experience in the act of walking given by their own perception of a situated body. In this sense, it was asked regarding physical ethnicity, transsexual identity and disability, whether these conditions were externally perceptible ones that could influence how the person was perceived in space. The complete survey text in English version is available in Annex 6.9.

3.4.2 Data collection outcome

The total amount of data obtained from the survey consists of a total of No. 1808 responses (No. 1762 Italian responses; No. 46 English responses). These responses were initially cleaned and translated from English to Italian, in order to have a definitive raw dataset. This dataset was then divided in the following sections:

- Mobility profile: questions from 1 to 6;
- Safety perception profile: questions from 7 to 12;

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- Safety Factors: questions from 13 to 40;
- Open answers on safety perception: questions from 41 to 45;
- Sexual harassment and sexual violence: questions 46 and 47;
- Demographic profile: questions from 48 to 65.

These sections were analyzed separately and then the results of various sections were compared in order to intersect various aspects of the respondents.

3.4.3 Quantitative data analysis

The quantitative analysis covers most of the survey data, by including all of the closed-ended questions. The methodology for the analysis is as follows.

Demographic Analysis

The aim of this analysis is to understand the demographic characteristics of the respondents who participated in the survey. Detailed demographic data was gathered through the survey, and consequently regrouped into grouped categories where sample sizes were too small, considering a benchmark of a minimum of 15 people for each group for it to be representative. The resulting groups from this exercise were used to analyze data throughout the survey analysis, and they consist of the following:

- Gender: woman and gender minority, man, rather not say;
- Age: 18-25, 26-35, 36-45, 46-59, over 60;
- Orientation: heterosexual, bisexual, homosexual, other, rather not say;
- Ethnicity: white, other ethnicities + mixed ethnicities, rather not say;
- Religion: none, christian, none/christian, buddhist, other, rather not say;
- Citizenship: Italian, non-italian;
- Disability: not disabled, disabled, rather not say;
- Education: middle school certificate, high school diploma, bachelor's degree, master degree, higher education, rather not say;
- Economic status: I struggle to meet basic needs, I respond to basic needs, I meet secondary needs, I can access extra expenses, rather not say;

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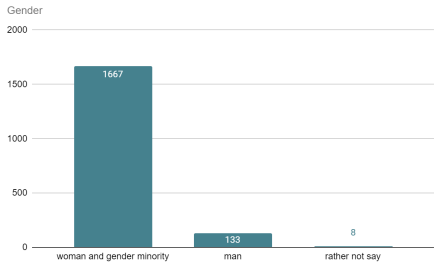
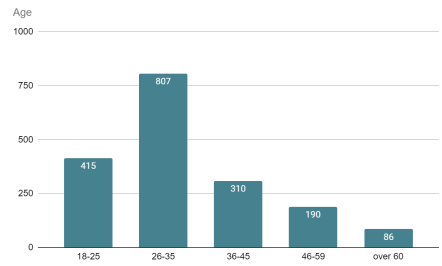
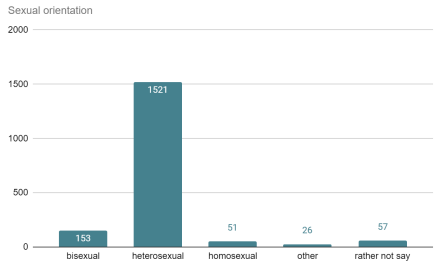
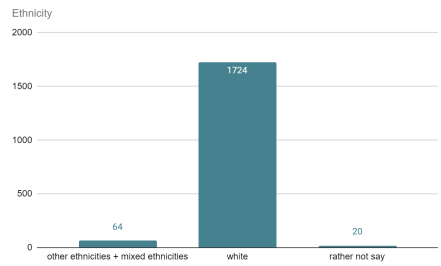
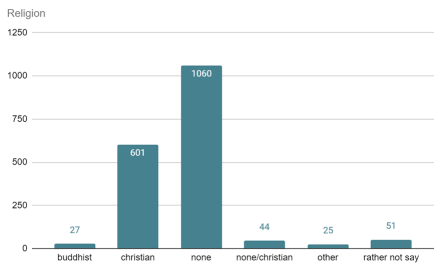
– Employment status: employed, student, retired, unemployed, unpaid work (unpaid work+homemaker), other (other+undeclared work).

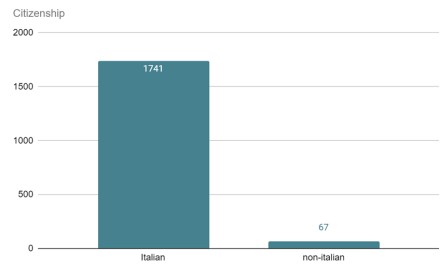


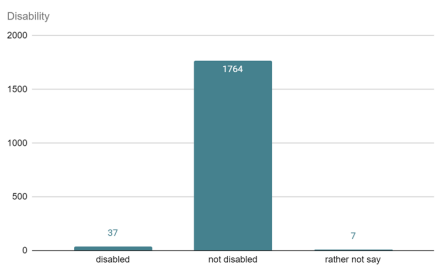


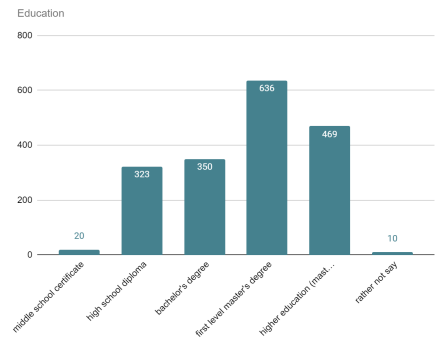












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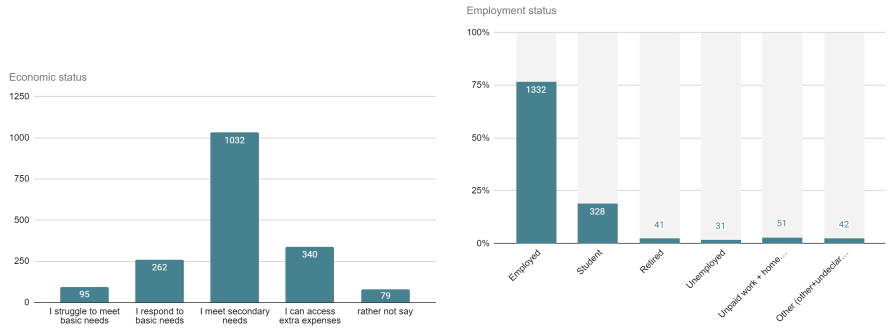

Figure 3-19 Results of the demographic distribution of survey participants per gender, age, sexual orientation, ethnicity, religion, citizenship, disability, education, economic status, employment status

It is important to note that despite the survey explicitly targeting a wide diversity of participants through various channels, the diversity of participants who responded to the survey remains limited, especially with respect to nationality, ethnicity and to a large extent with respect to gender identity. The majority of respondents identified as white (95%), Italian (96%), abled (97%) women (92%), which leads to natural limitations on the relevance of the results to a broad range of users, as well as limitations on the applicability of an intersectional framework for data analysis. On the other hand, the respondent sample base has a fairly representative distribution in terms of age, sexual orientation, education level and economic status, as shown from Figure 3-19.

Mobility Data Analysis

The analysis offers an overview of the mobility profile of the women and gender minorities group participating in the questionnaire (see Figure 3-23). Mobility profile as in transport patterns, behaviors regarding transport modes and timetables. The questions analyzed in this section are the following:

- Question 4: transport modes used most in the city of Milan;
- Question 5: amount of time a day spent walking;
- Question 6: most common walking times throughout the day.

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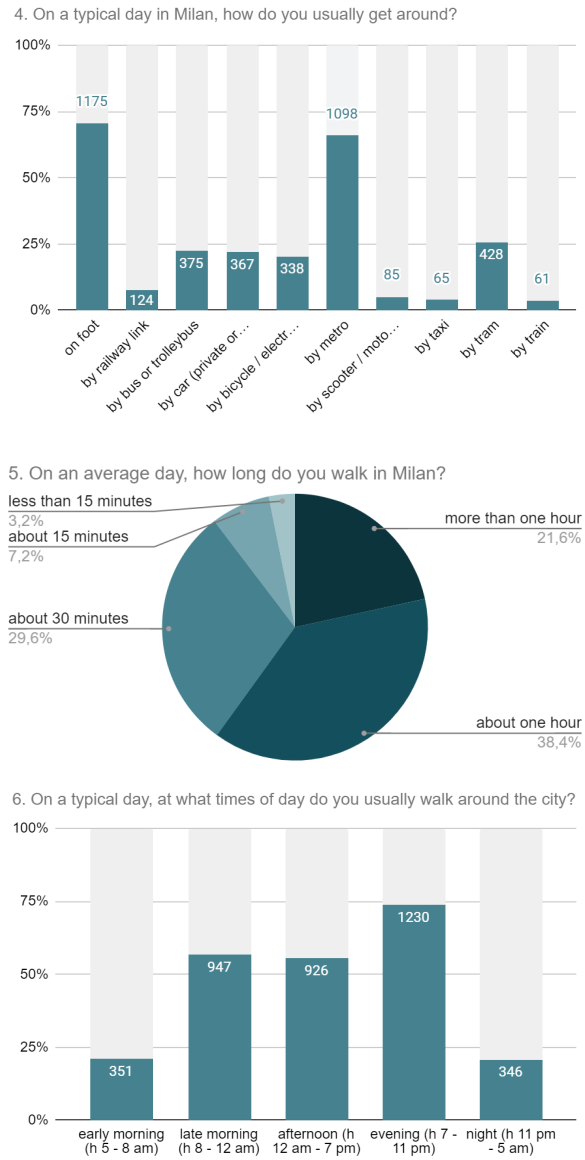

Figure 3-20 Results of the mobility data analysis for survey participants. Modal share (top), average time walking (middle), usual time of day walking (bottom)

The results showed that walking and metro are the most popular transport modes used by the women and gender minority respondents, and around 90% of women and gender minorities reported walking at least 30 minutes per day in the city. Among the daily time segments, the evening segment was revealed as the most popular time to walk (7-11 pm), while early morning (5-8 am) and night (11 pm - 5 am) are the

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least popular. These results are significant in showing the importance of walking in women and gender minorities' daily routines and thereby, the importance of enhancing their sense of safety across the time spectrum.

3.4.4 Safety perception analysis

The analysis shows general perception of safety while walking in the city (see Figure 3-24). It is divided in three parts: the first part shows a difference in perception between the genders, the second part is based on the perception and experience of women and gender minorities and the third part is the intersectional analysis. The intersectional analysis focuses on women and gender minorities participants and how the perception of safety and sexual harassment/violence experience varies based on the intersection with other axes of discrimination.

- Comparison between women+ and men's perceptions of safety while walking in Milan;
- General perception of safety shown as a comparison between the genders (men and women and gender minorities) shows how the perception of safety is much lower for women and gender minorities compared to men, and for both during nighttime with respect to daytime. It is also noticeable that gender also interferes with behavioral aspects as men are more likely to go out in the evening and nighttime compared to women and gender minorities, and to feel safe doing so. For those among women and gender minorities who reported that they do not go out at night alone, 70% cited fear as the main reason.

Further analysis was aimed to focus on women and gender minorities' perception of safety in their areas of residence. This analysis has the aim of assessing how neighborhoods are perceived by their inhabitants. This data is further analyzed against the respondent's postal codes to give some indication of spatial variation. It is important to remember, however, that the possibility to infer residential information from postal codes is limited due to the scale of the spatial unit, as well as the limited number of associations between respondents and specific CAPs or postal codes. It is also important to note that these results are not a general reflection

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of perceptions of safety in these areas or CAPs but rather a reflection of the participants' sense of safety in their immediate daily surroundings, which correspond to these zones.

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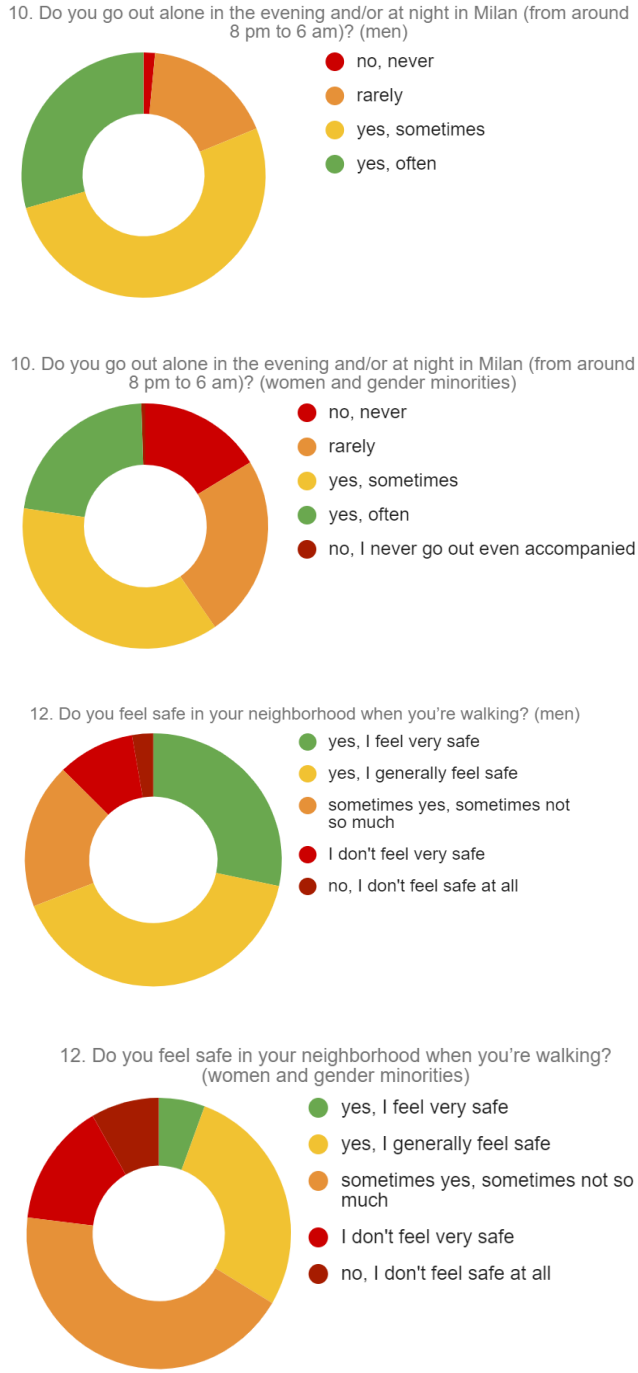

Figure 3-21 Results of the safety perception analysis, comparison between genders

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When analyzing women and gender minorities' responses with regards to their sense of safety in their own neighborhoods, results were mixed. Among the 10 most recurring CAPs (those where at least 50 respondents live), some postal code areas had more positive than negative reviews while others had more negative than positive reviews. Further information regarding intersectional differences across age groups could be found and are discussed below (see Figure 3-21).

Figure 3-22 Safety perception analysis of women and gender minorities within their own neighborhood

A deeper look at the data shows that their own neighborhood's perception of safety is particularly negative for inhabitants of the CAPs including the areas of Stazione Centrale and Stazione Garibaldi (20124) and in the areas including Loreto and via Padova (20127). Perceptions are more positive in CAPs that include the areas of Porta Romana (20135) and Porta Genova/Porta Magenta (20144).

Remaining CAPs are associated with a positive perception of safety apart from the CAP including the area of Casoretto (20131) where results are neutral. It is important to note that CAPs include several districts, and so it is not possible from the data to associate participants' perceptions of safety with specific neighborhoods at this level.

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CAP	Yes, I feel very safe	Yes, I generally feel safe	Sometimes yes, sometimes not so much	I don't feel very safe	No, I don't feel safe at all	Weighted Average
20123	5	21	21	4	1	3.48
20124	1	6	27	17	12	2.48
20127	2	9	19	15	11	2.57
20129	3	26	38	7	0	3.34
20131	3	20	30	13	10	2.91
20133	4	21	24	2	5	3.30
20135	9	22	19	5	1	3.59
20144	7	29	29	3	1	3.55
20146	4	20	34	9	0	3.28
20154	4	18	26	8	4	3.17

Table 3-4 Safety perception analysis of women and gender minorities

See Table 3-4, Figure 3-23, Figure 3-24, Figure 3-25, Figure 3-26 and Figure 3-27.
Further analysis was focused on the relation between walking perceptions of safety and experience of sexual harassment or violence. This analysis shows the influence of having experienced sexual harassment/violence on perception of safety and the behaviour pattern of going out at night and fear as a factor. In this case the main selected group is women and gender minorities who have suffered sexual harassment/violence (only considering the answers "yes, sometimes" and "yes, often"). These inputs are then compared to the general results regarding the safety perception of women and gender minorities, with the objective to assess whether having experienced sexual harassment or violence has an influence on the perception of safety and the travel choices of women and gender minorities.
Of all women and gender minorities, 63% reported experiencing sexual harassment 'sometimes' or 'often', while 17% reported the same for sexual violence.

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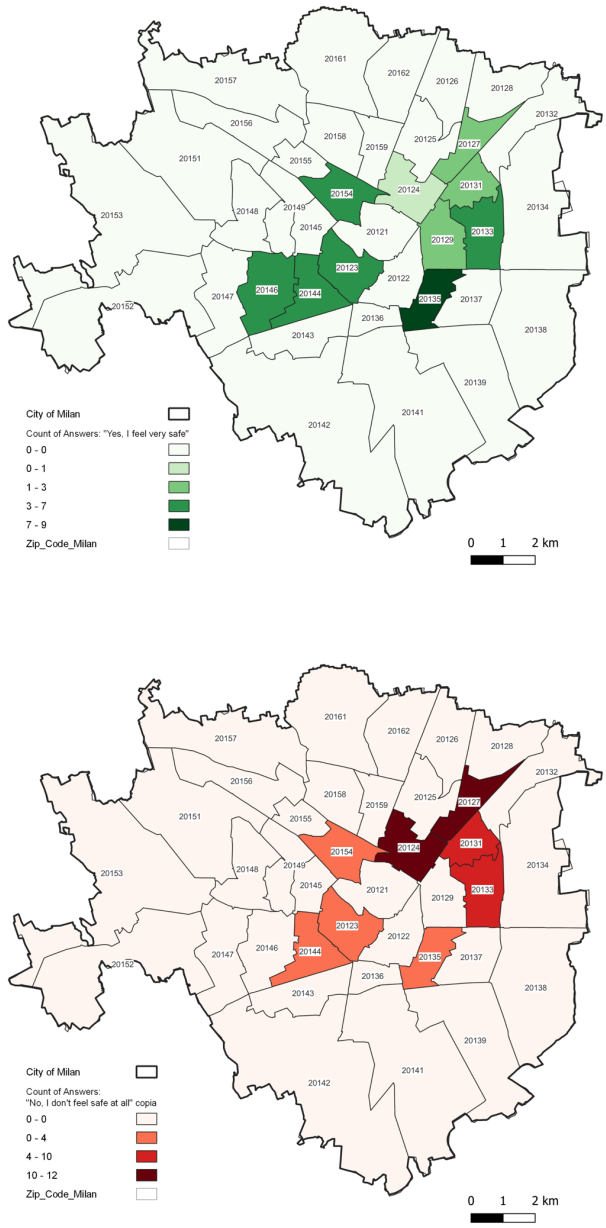

Figure 3-23 Count of Answers "Yes, I feel very safe" (top), count of Answers "No, I don't feel safe at all" (bottom)

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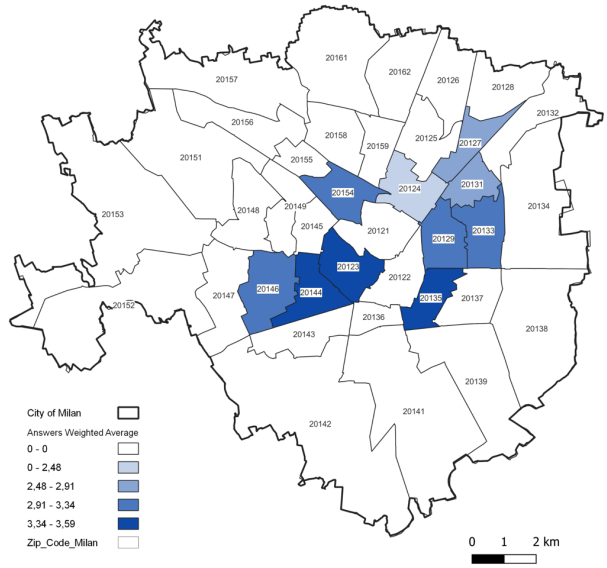

Figure 3-24 Survey Answers Weighted Average

Among those experiencing sexual harassment and/or violence on a regular basis (sometimes or often), the perception of safety while walking alone at night drops significantly, with more than 80% reporting often feeling unsafe, feeling very unsafe or not going out at night at all, relative to 57% of the those who rarely or never experience sexual harassment and/ or violence.

On the other hand, the likelihood of women and gender minorities to go out at night remains about the same (about 40% rarely or never go out at night alone regardless of experience of sexual harassment or violence). Interestingly, among women who reported frequent encounter with sexual harassment and/or sexual violence, only 48% cite fear as the main reason for not going out (compared to 70% of all women and gender minorities), suggesting there are other factors at play influencing their decision not to go out during nighttime hours. These results are significant in showing the interrelationship between experiences of sexual harassment or violence and women and gender minorities' perceptions of safety while walking in the city. They point towards an a priori condition that is unrelated to the spatial characteristics or social conditions of the physical setting of walking that have a significant impact on

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sense of safety while out walking, but not on the likelihood to go out at night. Further analysis was focused on the intersectional analysis of safety perception between gender and other axes of discrimination.

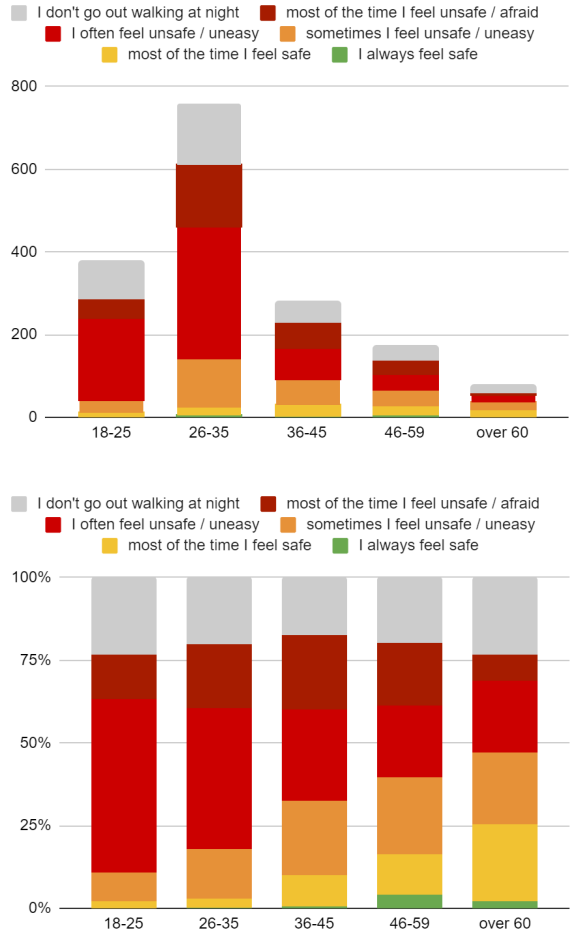

Figure 3-25 Intersectional results of nighttime safety perception by age group. Total number (top), percentages (bottom)

This intersectional analysis of perception of safety for women and gender minorities shows how the perception of safety varies based on the intersection of two axes of discrimination (gender + other). This type of analysis can yield deeper information into the compounded impact of gender and other intersectional identities on women's perceptions of safety. The intersectional analysis highlights the role of age and

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economic conditions in differentiating women and gender minorities' safety perceptions while walking.

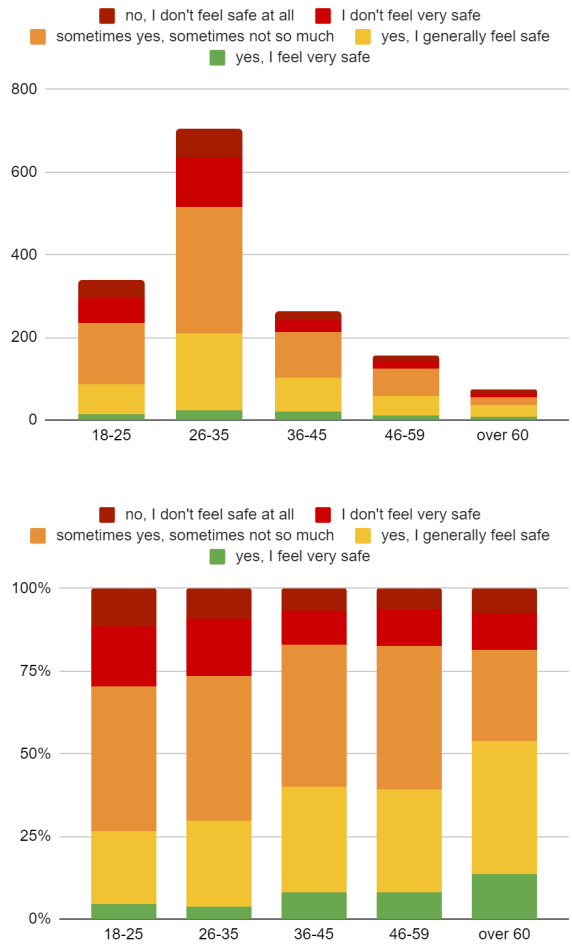

Figure 3-26 Intersectional results of nighttime safety perception in own neighborhood by age group. Total number (top), percentages (bottom)

The results also indicate differences based on ethnicity, although a more robust and well-distributed dataset would be needed to confirm this correlation. Older age groups are more likely to have a higher perception of safety while walking in Milan both by day and night than younger age groups. Close to zero percent of those in the 18-25 age bracket reported always feeling safe (count: 1) and only 2.4% reported mostly feeling safe while walking at night, compared to 2.6% and 23.1%, respectively

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of those over the age of sixty. In contrast, just over half (52%) of those aged 18-25 reported mostly feeling unsafe while walking at night, compared to just a fifth (21%) of those aged 60 and above.

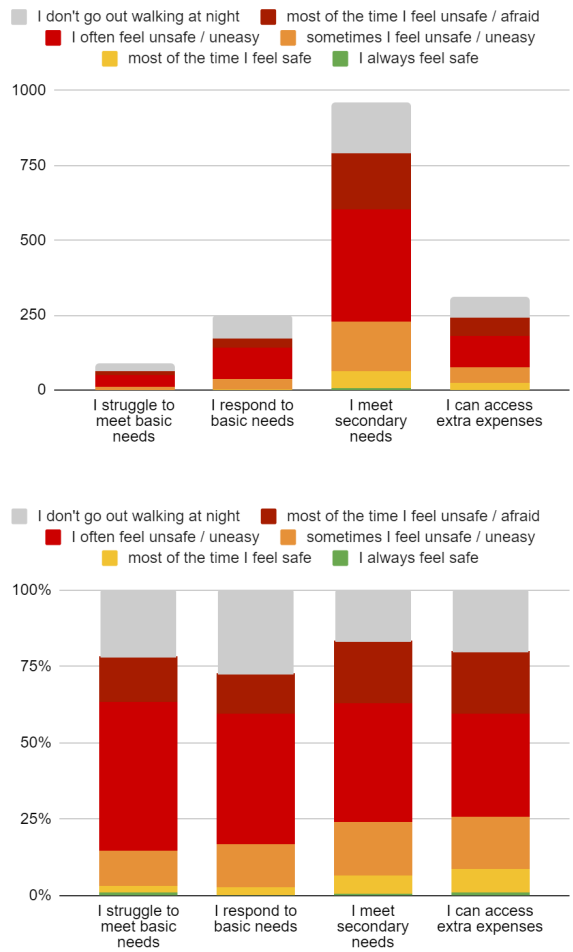

Figure 3-27 Intersectional results of nighttime safety perception by economic status. Total number (top), percentages (bottom)

The data points to an inverse relationship between age and sense of safety for adult women and gender minorities both during day and night, with larger variances reported during nighttime. Older age groups tend to also have a higher perception of safety in their own neighborhoods, which is something that doesn't stand out for

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younger age groups. When we cross-analyse the data for sense of safety in one's own neighborhood with age, we find that more women in the highest age groups feel quite safe or mostly safe in their neighborhoods with respect to the share of women in the lowest age groups (18-25: 4.8%, 22.3%; Over 60: 13.9%, 40.3%). At the same time, more women in the younger age groups say they do not feel safe at all walking in their neighborhoods at night than older women (18-25: 11%; 60+: 6.9%). This distinction suggests that a sense of safety in one's own neighborhood may be linked to cultural and social differences related to social ties, rootedness and familiarity in one's area of residence.

Safety Factors Analysis

The analysis shows the results regarding the safety factors at nighttime addressed in the second section of the survey (see Figure 3-31 and Figure 3-32). The questions were based on the Likert rating scale, consequently the results offer information on the relevance of each factor (which can be either relevant or non-relevant) and on the connotation (which can be either positive or negative). A factor can either have no influence on the perception of safety or it can have an influence, in the second case the safety factor can contribute to producing a feeling of safety (positive) or a feeling of unsafety (negative).

The rating is expressed on a scale from 1 to 5, 1 being the lowest rating and 5 being the highest: (*i*) It makes me feel very unsafe; (*ii*) It makes me feel unsafe; (*iii*) Neutral; (*iv*) It makes me feel safe; (*v*) It makes me feel very safe. The results consist of a total number of 1808 ratings for each safety factor, which can be synthesized in an average which, on its own however, doesn't provide the information regarding the relevance of the safety factor.

Quantitative analysis of the counts of ratings given by women and gender minorities to each safety factor, visible in Figure 3-28. This analysis indicates the connotation of the safety factors and the relevance, where a majority of ratings is equal to 3 (neutral) the safety factor results as non relevant to the perception of safety. This is the case for factors such as "equipped squares", "presence of recognisable charging points for smartphones" and "diverse presence of people", although this last factor

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is believed to have been written ambiguously, hence not fully understood by the respondents and not to be regarded as reliable.

Quantitative analysis of the variation of the average ratings of each Safety Factor, by considering the general women and gender minorities average as a point of reference. The variation of the averages is analyzed as a comparison between genders (men vs women and gender minorities) and as a comparison between subcategories of women and gender minorities, based on the intersection of other axes of discrimination as shown in Annex VIII: age, orientation, ethnicity, religion, citizenship, disability, education, economic status. The Table shows the variations of average compared to the safety factors perceived by women and gender minorities, we'll analyze them in order of excess value in the variation.

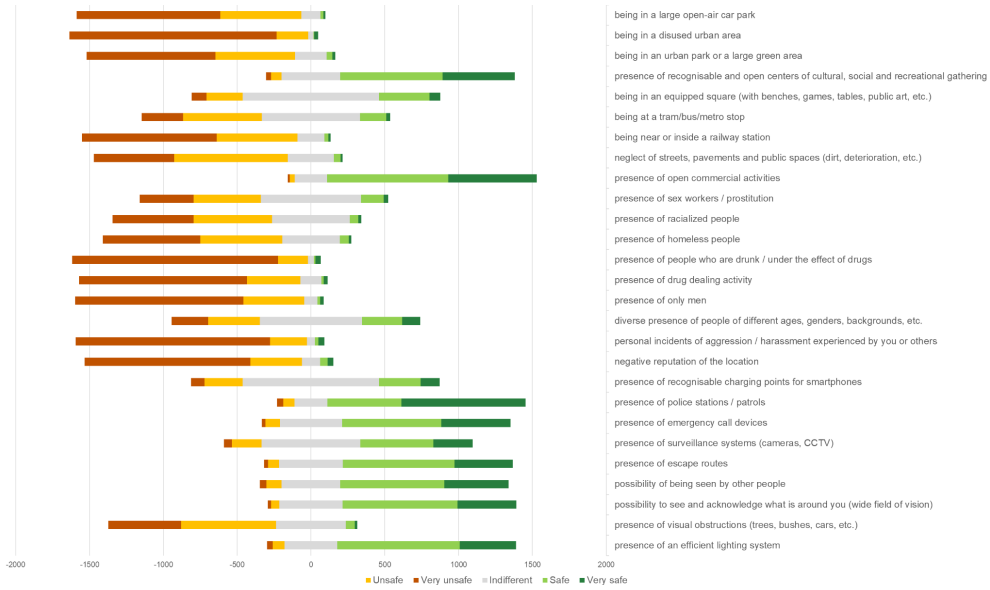

Figure 3-28 Count of ratings given by women and gender minorities to each safety factor

Very few variations exceed the value one, for example the safety factor concerning the "presence of only men" is perceived by women and gender minorities with an average of 1.44 (negative connotation) whereas men perceive the same factor with a variation of +1.03 (so an average of 2.47), this means men still perceive the presence of only men as generally more unsafe, but it seems to be less relevant as

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a factor to men than it is to women and gender minorities. Between the categories of men and women+gender minorities there doesn't seem to be any other particularly relevant variation, it's interesting to note however that when the average is over 3.0 for women+gender minorities (positive connotation), the variation for men will usually be negative and when the average is below 3.0 for women+gender minorities (negative connotation), the variation for men is usually positive, this indicates that the safety factors have a more neutral meaning for men than they do for women and gender minorities.

The only other case where the variation exceeds the value one regards the "presence of police stations /patrols", in this case the categories included in sexual orientation present significative variations, while women generally perceive the average weight of the factor as 4.20 (positive connotation), people who identify as homosexual and bisexual both have a variation of around -0.5, people who identify as other on the other hand have a variation of -1,03 (but in this case it's only 1% of the respondents so the average variation may not be reliable).

In the categories of age some factors that are generally perceived as unsafe are subject to a variation that goes from around -0.2 for younger generations to +0,5 for over 60 year olds. This means the factors of "presence of men", "railway station" and "tram/bus/metro station" result as more neutral to categories of people who are older.

The categories regarding disability present a significant variance regarding the factor of "the possibility to be seen by other people", the general average is 3.82 but the variation for people who have a disability is of -0.65 meaning that for those people this factor has a much lower impact on their perception of safety.

Finally, the analysis takes into consideration the impact of safety factors during daytime (question 40), by analyzing their relevance for the women and gender minorities group. In this case, as previously stated, a simple multiple-choice question was used, so the information shows which factors were voted by more people as factors relevant to a feeling of unsafety. The most relevant factors are "underground or enclosed unlit spaces", "presence of people who are drunk/under the effect of drugs" and "the negative reputation of the location. The least relevant factors are

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"the presence of surveillance systems (cameras, CCTV)", "the impossibility to see and acknowledge what is around you (narrow field of vision)" and "the presence of police stations/ patrols".

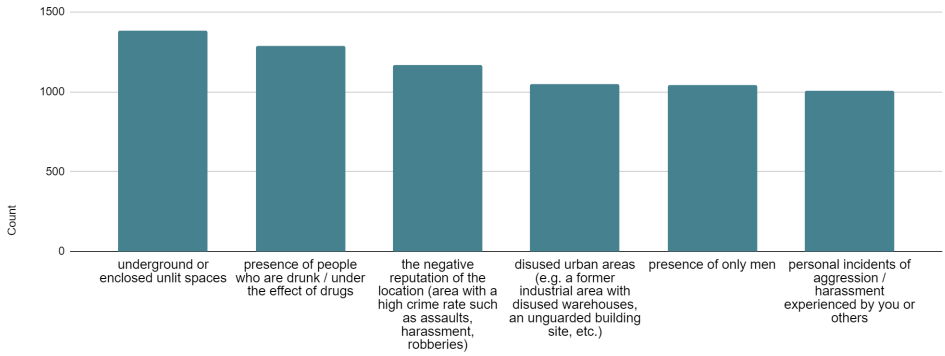

Figure 3-29 Safety factors relevant by day which were selected over 1000 times

For the sake of enabling a comparison among different demographic groups, the quantitative analysis was performed by analyzing the average values of the ratings. However, the Likert scale is known to have inherent limitations and biases, both regarding the interpretation of the numbers as continuous variables (Jamieson, 2004, Cohen et al., 2002) and regarding the meaning of the neutral value (Nadler et al., 2015). While this method allows for a direct comparison among demographic groups, and it was deemed relevant to include here, for an unbiased representation of the survey results, please refer to Annex VIII.

3.4.5 Qualitative data analysis

A qualitative analysis was carried out on questions with open-ended answers, i.e. questions 42, 44 and 45 in the survey. Only responses from women and gender minorities (non-male respondents) were considered. The methodology for analysis is divided into two parts: a) Counts of responses classified into categories were generated using GPT-3.5 (Generative Pre-trained Transformer), an artificial intelligence language model developed by OpenAI, following the same procedure for all three sets of responses: factors contributing to a sense of safety in specific locations in Milan (42), factors contributing to a sense of unsafety in specific locations

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in Milan (44), and strategies adopted by respondents to feel safer or less vulnerable when walking alone at night (45); and b) a qualitative interpretation of the responses to the three questions.

First, a representative and uniform set of 50 responses were manually selected and labeled in order to train the GPT model. These were chosen to reflect all the main factors mentioned in user responses, based on the analysis of a larger set. These 50 responses were then manually labeled with the list of all items they explicitly mentioned, and these labeled responses were thus used to finetune a GPT3.5 model. Once the model was trained, it was run on the entire list of responses to classify and label them autonomously. Thus, factors that were not included in the first phase were in any case subsequently generated by GPT on its own, expanding the list of factors from the initial manual selection.

POSITIVE FACTORS - Open answers	POSITIVE FACTORS - Interpretations
There is a lot of light, the boulevard is wide, there are always people, metro or bus stops, usually a few bars are open	good lighting, good visibility, presence of people, bus stops, open activities
University campus; pedestrianized areas; nighttime attendance by young people or people of various ages/genders; businesses open late or 24/7; good lighting; well-kept/renovated/coloured environment.	pedestrian areas, presence of people, young people, open activities, good lighting, care of space
There are bars open, an underground and a supermarket. This guarantees movement until around midnight. The square is well lit (but not the streets leading off the square). The pavements are spacious so I can walk well apart. It is a well-known place	open activities, public transport, presence of people, good lighting, large spaces, familiarity
There are well frequented places, lots of escape routes, well lit	presence of people, decorum, escape routes, good lighting
In front of the Triennale there are always a lot of people, maybe even drunk because they've just come out of the Just, but there are so many people that I feel safe cycling past. Via Pagano, on the other hand, makes me feel calm because it's completely residential and it's close to my house.	presence of people, dwellings, familiarity

Table 3-5 Open answers and interpretations of positive factors

The interpretation of the responses using this method has certain advantages and limitations. The main advantage is that it allows us to quantify responses using a

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strong interpretative tool to classify thousands of responses into meaningful categories. At the same time, this means that some answers were necessarily interpreted from a potentially biased point of view. The issue of surveillance, for example, was kept distinct from law enforcement, although for some it was perhaps essentially the same thing. Decorum, on the other hand, is a factor that is barely mentioned per se but is implicit in the answers as a type of attitude or imagery expressed, and thus appears as an interpretation of other descriptive text by the GPT model.

Some examples of interpretations from open answers to keywords or key phrases are reported in Table 3-5, Table 3-6, and Table 3-7.

NEGATIVE FACTORS - Open answers	NEGATIVE FACTORS - Interpretations
At Porta Venezia and Corso Buenos Aires there are many drunk men making loud comments, at Milano Rogoredo and Bisceglie there is no one and it is very dark with small parks and bushes	substance abuse, groups of men, catcalling, poor lighting, poor visibility, harassing people
Depending on where you go, you have to go a long way underground, with some blind corners, with no guards for a long way, with some paths backed by walls that take away your view	poor visibility, subways, absence of people, blind walls
High criminality, little police control, unfamiliar areas, suspicious people (drug dealing, people looking suspiciously at passers-by...)	crime, absence of law enforcement, unfamiliar places, ill intentioned, drug dealing, harassing people
High presence of male figure groups, degradation in the streets, numerous homeless, people (men) visibly altered due to alcohol, drugs or mental disorders	groups of men, degradation, homelessness, substance abuse
Absence of shops/restaurants/clubs, no female people but only male people, poor lighting, presence of large and unguarded parking spaces, neglect and degradation of the area, presence of parks to walk through	absence of activity, absence of women, groups of men, poor lighting, parking, absence of surveillance, degradation, parks

Table 3-6 Open answers and interpretations of negative factors

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STRATEGIES - Open answers	STRATEGIES - interpretations
I live near the metro stop and perceive the area as safe. If I am on the metro/tram that drops me off close to home I feel safe. To get to the tram or metro stop I try to be accompanied. If not, I will call someone. If I really don't feel up to it, I take a taxi back.	I am accompanied, I phone someone, I take the taxi
I speed up, call someone, cross the street according to where there are more recommendable people and open services, I stop and enter a bar stating that I feel I am being chased so I ask if I can wait a moment to see what to do and if my hunch was true (most of the time it was confirmed)	I walk fast, I phone someone, I change pavement, I enter a bar
Emergency alarm, pepper spray, walking fast, always being accompanied by someone, being on the phone with someone who could rush to me in case of an emergency	emergency alarm, pepper spray, I walk fast, I phone someone
Walk with keys in hand to recognise any harassers. Remain on guard and look around.	keys in fist, I stay on guard, I look around
carrying pepper spray, holding house/car keys, walking fast and avoiding isolated places, having face and head covered so as not to be easily recognisable as a young girl	pepper spray, keys in fist, I walk fast, I avoid isolated places, I disguise my appearance

Table 3-7 Open answers and interpretations of strategies

In general, several answers could have been merged, but it was decided to keep them separate and distinct so as not to over-interpret them. After all, the translation into key words or key phrases is already the result of an interpretation, which to a certain extent translates qualitative data into quantitative data.

The GPT3.5 model thus trained with the interpretations was then asked to find items explicitly mentioned in each response by picking them from the list of all items, and the results were collected from 10 different runs randomizing item order for each run.

Finally, for each response, all items that the model found at least 6 out of 10 times were considered valid and counted towards overall statistics (see Table 3-8).

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Negative Factors	Amount of Mentions	Positive Factors	Amount of Mentions	Strategies	Amount of Mentions
Substance abuse	324	Presence of people	586	I phone someone	574
Poor lighting	276	Open activities	379	I walk fast	451
Absence of people	220	Good lighting	307	Hand-held telephone	277
Groups of men	202	Dwellings	111	Keys in fist	223
Drug dealing	187	Decorum	96	I pretend to make a call	141
Homeless	153	Law enforcement	89	I look around	122
Degradation	150	Familiarity	70	Pepper spray	122
Ill-intentioned	134	Traffic	59	I disguise my appearance	80
Immigration	102	Young people	42	I don't look in the face	74
Closed businesses	102	Care of spaces	41	I share my position	63
Absence of law enforcement	98	Neighbourhood	33	I avoid isolated places	66
Aggressions suffered	85	Escape routes	30	I flank potential allies	57
Harassing people	72	Cameras	23	I flaunt confidence	58
Poor visibility	71	Public transport	17	I am accompanied	55
Poor escape routes	64	Good visibility	17	I walk in the street	50
Catcalling	62	Students	14	I stay on guard	46
Filth	59	Good reputation	14	I take off my headphones	40
Crime	54	Women	13	Stare down	31
Absence of surveillance	52	Taxis	10	Earphones without sound	25
Large spaces	46	Bus stops	9	I look for escape routes	24
Violence	45	Tourists	9	I change my route	21
Bad reputation	41	Services	6	I avoid dark places	21
Groups of young people	37	Dustmen	3	I warn when i arrive	16
Subways	31	Sports facilities	3	I change pavement	14
Poorness	24			I listen to music	14
Absence of housing	13			I grab my bag	13
Unknown	10			alarm app	12

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places	
Prostitution	7
Architectural barriers	7
Presence of law enforcement	6
Traffic	6
Blind walls	5
Residential areas	5
Armed people	5
Assaults	5
Pedestrian areas	4
Groups of people	4

I enter a bar	10
Penknife in pocket	9
Emergency alarm	6
I pretend to be crazy	5
I take the taxi	7

Table 3-8 Amount of mention with Negative and Positive Factors and Strategies

While many of the factors mentioned coincide with the list of safety factors defined through the literature review and used in the data analysis, several new themes emerged in the survey responses. Some of the themes related to Spatial Features are large spaces, which emerged as having a negative effect on sense of safety (46 counts) and residential areas or presence of dwellings, which were considered positive (111 counts), whereas absence of housing was mentioned as a negative factor (13 counts).

Alternatively, several new themes related to City Use also emerged, these include the presence of immigrant populations (mentioned by the respondents as negative; 102 counts), decorum (positive; 96 counts) and presence of students (positive; 14). An interesting distinction also emerges in relation to the presence of young people, where the presence of young people is seen as positive (42 counts) but the presence of 'groups of young people' is seen as negative (37 counts). In terms of Hotspots, public transport, taxi and bus facilities were mentioned as having a positive influence (10 and 9 counts, respectively).

It is important to also mention the role of 'personal' factors in influencing perceptions of safety. This was not an element covered in the research due to subjectivity, however, it is interesting to note their predominance in the gathered open responses. Such factors include: familiarity with the area (positive; 70 counts), proximity to home

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or 'neighborhood' (positive; 33 counts), personal aggressions or assaults suffered in the area (negative; 85 counts) and lack of familiarity with the area or 'unknown places' (negative; 10 counts). In addition to these, the good or bad reputation of an area appears to have a notable impact on perception of safety, mentioned both in positive and negative terms (14 and 41 counts, respectively).

Figure 3-30 (top left) Negative Factors Word Cloud. (top right) Positive Factors Word Cloud. (bottom) Adopted strategies Word Cloud

In sum, the results from open-answer questions in the survey largely complimented and reinforced the safety factors identified at the start of the research. Additional

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themes emerged from these user and respondent inputs that had not been included in the safety factor list derived from the literature. These include sub-factors in themes dealt with in the research (1, 2) and themes that were not considered in the research (3-5), as per the following list: (i) Spatial Features: Residential areas; Pedestrian areas; High-end retail land use; (ii) City Use: Appearance of Luxury/ Poverty; (iii) Mobility Conditions: Public transport, Road traffic, and Taxis; (iv) Public Perception: Area reputation; (v) Personal/subjective Factors: Area familiarity; and (vi) (Own) area of residence.

While some of these themes relate to subjective experiences and thus would not be possible to include in this type of analysis, other themes are worth considering more in-depth. For example, while transport hubs were considered under the theme of SF_L2_Hotspots, results from the textual analysis of Wher comments and survey responses also highlight the relevance of the presence of transport modes and of mobility conditions (such as road traffic) to women's perception of safety. These mobility features, although not strictly dealing with walking infrastructure and conditions, seem to have an influence not just on the experience of walking, but also on the experience of walking in relation to safety perception (see Figure 3-30).

Reported strategies adopted by the survey respondents in order to feel more safe or secure in public space vary in nature.

These mentioned strategies can be split into three main categories: (i) manipulating the urban environment; (ii) manipulating one's person/ changing behavior; and (iii) social strategies/ reaching out to others for help. It is interesting to see how urban strategies reflect some of the safety factors identified in the study, and in particular in relation to isolated areas, escape route options, lighting, open commercial activities, presence of transport options and presence of emergency alarms. In addition to this, it is also interesting to note a subgroup of personal strategies related to the use of one's own mobile phone. Seven of the personal strategies mentioned in the responses to this survey question involve the use and some functionality of a mobile phone (see Table 3-10). This highlights the importance of handheld devices in enhancing women and gender minorities' perceptions of safety while walking in

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contemporary urban environments and opens up avenues for exploring their role in public space via communication and navigation services.

Strategies (urban)	Count	Strategies (person)	Count	Strategies (person/ phone)	Count	Strategies (social)	Count
I avoid isolated places	66	I walk fast	451	I phone someone	574	I flank potential allies	57
I walk in the street	50	Keys in fist	223	Hand-held telephone	277	I share my position	63
I look for escape routes	24	I look around	122	I pretend to make a call	141	I am accompanied	55
I change my route	21	Pepper spray	122	I share my position	63	I warn when i arrive	16
I avoid dark places	21	I disguise my appearance	80	Earphones without sound	25	I enter a bar	10
I change pavement	14	I don't look in the face	74	I listen to music	14	I use an alarm app	12
I enter a bar	10	I flaunt confidence	58	I use an alarm app	12	I take the taxi	7
I take the taxi	7	I stay on guard	46				
Emergency alarm	6	I take off my headphones	40				
		Stare down	31				
		I grab my bag	13				
		Penknife in pocket	9				
		I pretend to be crazy	5				

Table 3-9 Strategies adopted by type

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3.5 Focus Groups

The focus groups enriched the research in a qualitative way, making it a collective and personal narrative: they allowed for the creation of a free space in which to listen to the direct testimonies of female citizens or queer people of various ages and backgrounds. The focus groups delved into the neighborhoods - which emerged from the overlapping of data from the Wher App and the open answers to the survey - that were perceived more negatively (Central Station and Loreto) or, on the contrary, were perceived more positively (Sarpi).

3.5.1 Methodology

Area Selection

The area selection for the focus groups is based on the results from both the Wher App data and the survey analysis (see Figure 3-34 and 3-35). The Wher App data provides more accurate georeferenced data, whereas the input from the survey is based on a wider diversity of respondents, so it is important to consider input from both sources when selecting the focus areas for focus group discussions. Given the diversity in scale and shape between area representations in the Wher App map and the survey results, as well as the lack of correspondence between voted areas and Nil divisions, the areas defined for the purpose of this selection are representative and are selected based on a wider neighborhood approach. It has been decided to select a total of three areas across the city, out of which two are among the most negatively rated (rated unsafe by highest number of users), and one is among the areas most positively rated. This is done to allow for a cross-examination of cases during focus group discussions to better understand the factors that influence perceptions of safety and unsafety. The selection criterion considers: data coverage, score or rating, overlap of Wher and survey results.

- Data coverage:
  - Rated areas outside Milan boundaries were excluded;
  - Wher App: Threshold of 95th percentile data coverage was applied corresponding to at least 16 comments per street segment (total: 45

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areas); rated areas in non-walkable environments (e.g. highways) were excluded; rated areas that are limited in size (e.g. stand-alone points and short street segments) were excluded;

- Survey Data: corresponds to 17 mentions per area (total: 31 areas).

- Score or rating:
  - Wher App data: the areas with the highest and lowest ratings were selected for further analysis. The highest scored areas correspond to a mean vote of 2.5 to 3 (25 out of 45 rated areas). The lowest scored areas correspond to a mean vote of 1 to 1.5 (20 out of 45 rated areas);
  - Survey: the areas were divided into positively and negatively perceived neighborhoods. Areas mentioned as "perceived as safe" are 15 out of 31 areas, areas mentioned as "perceived as unsafe" are 16 out of 31 areas.
- Overlap of Wher and survey results.

Locations of results of the Wher App rated areas were compared with textual results of safe/unsafe zones in the survey to select the areas that were relevant to both sources of data. In cases where there were different textual references to the same area, these were grouped together into one category since our interest is in zones as opposed to specific locations (e.g., Centrale and Central Station). This reduced the number of areas to a total of 7 out of 15 positively rated areas (clustered into 7 areas in total) and 8 out of 16 negatively rated areas (clustered into 5 areas in total) as listed below:

- Positively rated areas: Zona Centro (+ Duomo), Zona Sarpi, Porta Romana, Zona Isola, Corso Buenos Aires, Porta Venezia (Piazza Oberdan), Zona Moscova;
- Negatively rated areas: Zona Centrale (+ Stazione Centrale), Zona Loreto (+ Via Padova), Zona Corvetto, Zona Piazza Maciachini, Zona Lambrate (+ Stazione Lambrate).

Top-down selection: The top-down selection consists in a qualitative assessment of short list of areas based on the below considerations (selection of 3 areas):

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- Selection of 1 positively rated area and 2 negative areas, in order to evaluate positive against negative factors that influence perception of safety;
- Selection of demographically representative areas with diverse populations (e.g. multi-ethnic communities, areas with higher presence of vulnerable communities, e.g. by level of income);
- Selection of positive outliers. This applies to the case of the area of Centrale, reported in significantly higher proportions than anywhere else in the city as a place perceived as unsafe (in the survey, the Centrale NIL was mentioned 478 times whereas the second most mentioned area is the Porta Venezia NIL with only 143 mentions).

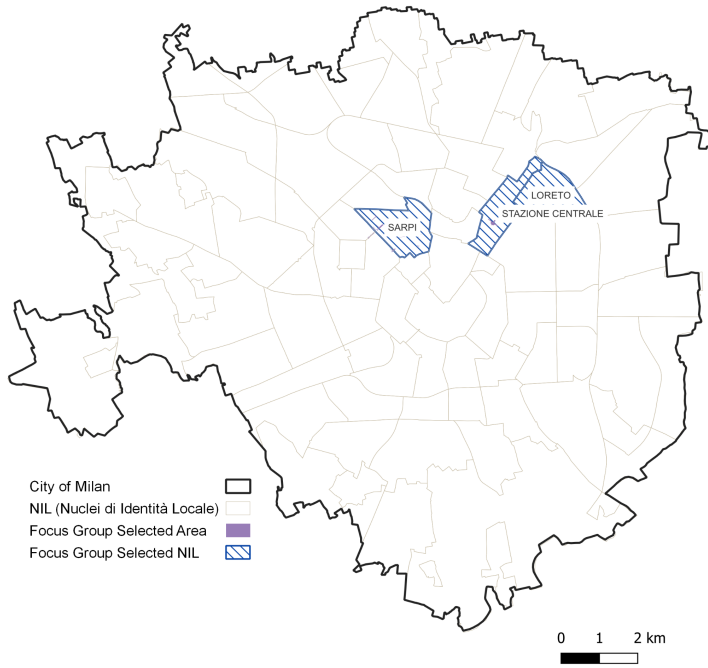

Figure 3-31 Focus Group Selected NILs

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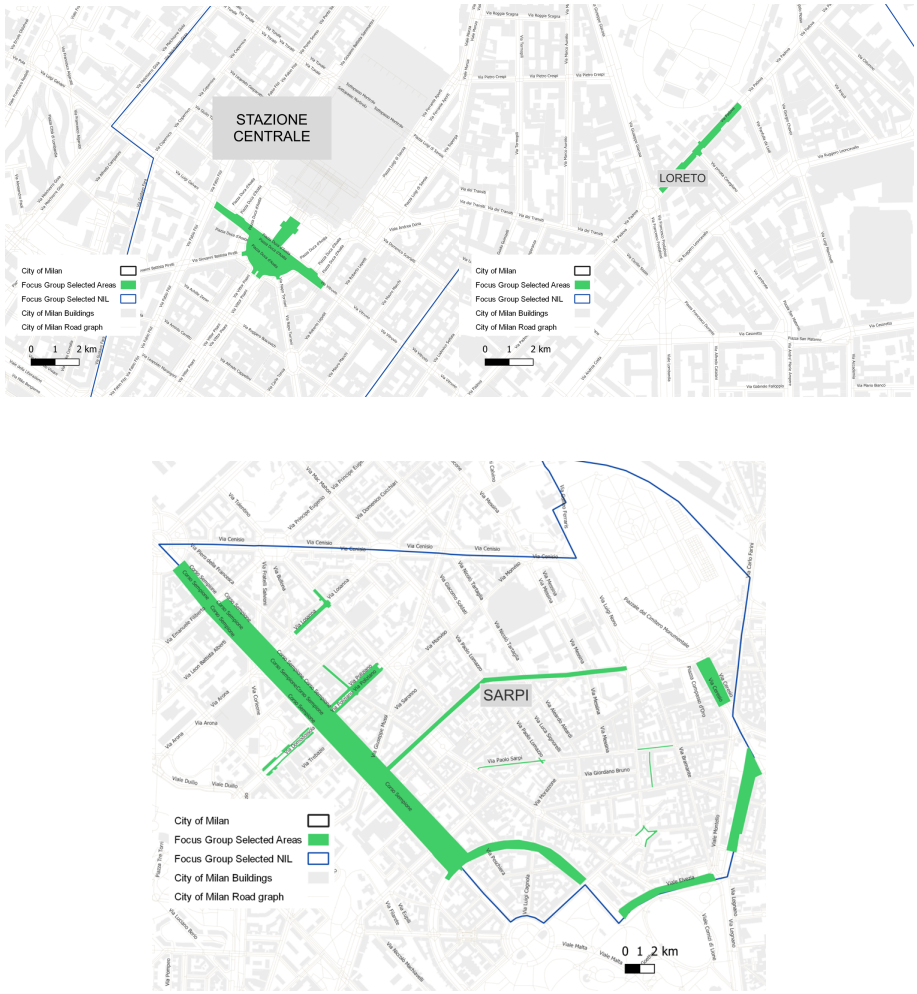

Figure 3-32 Focus Group selected areas in Central Station NIL, Loreto - Padova NIL, and Paolo Sarpi (Chinatown) NIL

Participant Selection Criteria

The process of participant selection significantly influenced the formulation of the research inquiry. Initially, there was consideration of limiting the sample to a specific age range, particularly between 20 and 30 years old. However, such constraints would have hindered a comparative analysis across generations and the exploration of diverse yet equally valuable perspectives and experiences. Consequently, it was decided to broaden the sample criteria to encompass not only women of all age groups residing in or frequenting the studied neighborhoods but also non-

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heterosexual males, potentially offering insights aligned with the LGBTQI+ community. Furthermore, participants were required to have previously expressed their perceptions of safety through the survey discussed in Section 4. This ensured inclusion of individuals who had already articulated their viewpoints on the subject, thereby contributing to a pre-existing body of personal reflections.

The key steps of the focus group sessions on neighborhoods identified as problematic (Centrale & Loreto-Padova) consisted of the following:

- Defining the designated area for discussion;
- Asking participants to mark areas on the map for locations in which they feel particularly vulnerable;
- Discussing concrete factors related to perceptions of safety (including personal experiences of aggressions suffered), focusing on specific locations marked on the map. The discussion also delved into daily life experiences and the personal significance of marked areas to the participants;
- Discussing the stigma of the neighborhood and its role in the perception of fear;
- Brainstorming as a group about possible solutions or strategies.

The key steps of the focus group sessions on neighborhoods identified as positive (Sarpi) consisted of the following:

- Defining the designated area for discussion;
- Asking participants to mark areas on the map for locations that are special to them, where they feel comfortable and which they like to visit even at night;
- Discussing concrete factors related to perceptions of safety, focusing on specific locations marked on the map. The discussion also delved into daily life experiences and the personal significance of marked areas to the participants;
- Discussing the reputation of the neighborhood and the role it plays in the perception of fear;
- Brainstorming as a group about potential strategies to replicate in problematic areas.

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It was decided to set the focus groups in semi-structured form. In fact, it was also considered important to detect the participants' individual choice in approaching the topic and setting up the narrative. In addition to the three macro-questions posed to the participants, there were a series of sub-topics on which - in the event that they had not already articulated on their own - the interviewer would have to ask for further details. Depending on the case, a number of unforeseen topics that arose spontaneously during the focus, could be explored in greater depth, particularly in cases where the moderator felt that these topics were useful for the participants' understanding.

The result of the sessions is a mapping of significant places in all three neighborhoods and three audio tracks from which the most effective testimonies were extracted. Subsequently, the most common themes and patterns were analyzed, along with the specific perceptions and problems related to the personal attributes and conditions of each participant.

Focus Groups Structure

The focus group sessions were designed as structured discussions using participatory mapping tools, facilitated by members of the Sex & the City research group. The sessions lasted about two hours each and involved four to six participants in each of three sessions, one for each selected neighborhood. Participants gathered around a table with a centrally positioned map depicting the discussed neighborhoods. The maps served as visual aids for pinpointing locations of interest, both positive and negative. The primary goal was to encourage participants to openly share their experiences within these neighborhoods and specific areas. Moderators guided discussions to explore elements that evoke discomfort or feelings of safety. The sessions were audio-recorded for documentation. These transcriptions were then carefully reviewed to extract noteworthy observations, identify recurring patterns, and capture significant content. The focus groups addressed some issues of particular relevance to the research, specifically the theme of the perception of safety. Below are the main results of each session.

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3.5.2 Centrale (Central Station)

Stazione Centrale is an area that we chose to delineate according to the boundaries indicated on the map (Figure 3-33): Via Giulio and Corrado Venini to the southeast, Via Parravicini / Via Sauli to the northeast, Via Melchiorre Gioia to the northwest, Via Caretto / Via Cappellini to the southwest. Due to the orientation of the map, some areas not strictly in the Central Station district were also included in the defined area.

Name (pseudonym)	Age	Nationality	Sexual orientation	Relation to area
Elena	22	Italian	heterosexual	resident
Silvia	34	Italian	heterosexual	resident
Matteo	34	Italian	homosexual	resident
Giuliana	55	Italian	heterosexual	resident

Table 3-10 Focus Group in Central Station NIL participants

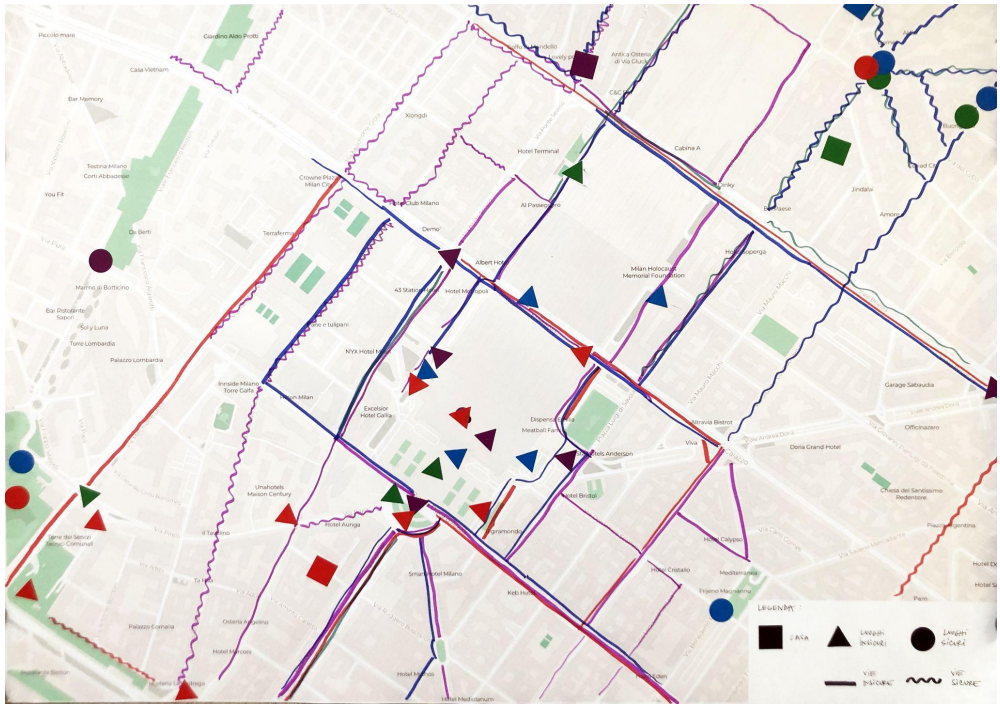

Figure 3-33 Map of the Central Station district with interventions by the participants

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The area considered is a particularly complex neighborhood due to the presence of the station, a transport hub not only for Milan but also for regional and national transport. This implies (i) a scarcely cohesive nature of the neighborhood, due to the extraordinary flows of users who often do not live in the city; (ii) a marked division between areas, given by the presence of the tracks and the division they imposed, which also leads to profound social and stylistic differences (from an architectural and urban perspective); and (iii) a significant presence of activities and attendance characteristic of the areas surrounding the stations: from the presence of homeless people, to the illegal sale of objects, to drug dealing, to prostitution.

Negative Factors

With regard to the negative aspects, a number of important themes emerged. In particular, one of the most discussed topics was about the type of people who frequented the neighborhood. Homelessness was one of the first topics discussed, as it appears to be a growing phenomenon in the neighborhood. The presence of individuals under the influence of substances (alcohol or drugs) was perceived as a source of deep discomfort by all participants. There was strong criticism against immigrants and foreigners - especially those with darker skin tones - which signaled discomfort due to their socioeconomic status, mixed with prejudiced attitudes. However, the main issue, however, from the participants' perspective, revolves mainly around gender, with origins often discussed in negative terms.

From different points of view but with the same results, the importance of knowing the context and the inhabitants, their habits, and the patterns of places emerges. Generally, what the participants fear most is the unknown, what is unfamiliar to them, different in manner, or what they do not understand. In this sense, an important aspect peculiar to the area under investigation is the lack of cohesion of the neighborhood. The chaos caused by various situations due to the nature of the area (city-users reaching the station by car, by public transport, by train, residents living there, and those passing through, alongside construction sites overlapping an already complex neighborhood), leads to significant confusion, resulting in insecurity and

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issues in the neighborhood for all participants. These aspects have been perceived as worsening in recent years.

Centrale is also, historically, a neighborhood with a very negative reputation, like almost all neighborhoods affected by the presence of a railway station. Furthermore, local news and episodes reported in the media, as well as first hand experiences occurred to the focus group participants, contributed significantly to defining a negative perception of the area.

Mixed Perception Factors

Some factors are perceived quite differently; while they may be a source of tranquility for some, they can be a source of deep discomfort for others. Taxi drivers represent one of these elements: for some, they provide a sense of security, while for others, the opposite is true, particularly as they are usually male.

Even more controversially, law enforcement is perceived, especially in the Piazza Duca d'Aosta area, as playing a very limited role in terms of enhancing security perception, unlike the reassuring effect provided by private security in the Piazza Gae Aulenti area.

In general, the presence of people is a factor that can be perceived in different ways: while the crowding of people - as observed - can pose problems due to various dynamics it creates, the absence of people is also problematic because it results in a loss of spontaneous supervision. However, this supervision is only possible when practiced by residents living in the neighborhood, who use the city more spontaneously and also with greater care as it is their own neighborhood.

Positive Factors

The care of spaces, the presence of security, good visibility, and the presence of activities that bring people to public spaces emerge as important factors in relation to the perception of safety. In particular, the ability to see and understand one’s surroundings and have a clear location of the people within them.

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Strategies/ Proposals

Regarding the possibility of replicating some of the positive features observed in safe areas, the participants brainstormed about the potential for the axis of Via Sammartini, which is considered one of the most problematic points in the area. There is a significant opportunity to reclaim the space under the tracks, and realistically, it has the potential for rather radical improvement and transformation. This could involve renovating warehouses and fostering neighborhood sociability through activities, widening pavements, rethinking bus parking, and encouraging businesses that enhance sociability, improving lighting, and reducing car parking.
With regard to Viale Brianza, which is also mentioned as problematic, the participants express the need to rethink the central area, which is basically inaccessible as it is today. Apart from physical implementations and rethinking of spaces, some pointed out the necessity of also promoting active citizenship to facilitate community integration in the area.

3.5.3 Loreto-Padova district

Loreto-Padova is an area we have chosen to delimit according to the boundaries indicated on the map (Figure 3-34): Via Nicola Antonio Porpora to the south, Via Teodosio to the southeast, Martiri della Libertà Iracheni Vittime del Terrorismo Park to the northeast, Villa Finzi Park to the northwest, and Piazzale Loreto to the southwest. Initially, the topic of negative aspects of the neighborhood was solicited, and participants were asked to refer to their own perceptions and experiences specifically in the analyzed neighborhood to focus on what most affects their daily lives. In a second stage, participants were urged to focus on safe places and to focus more precisely on what makes them safe places. In the final step, it was suggested that they do an imaginative exercise of redeveloping some problem spots through the development of proposals, based on the positive aspects that emerged from the safe areas. From the discussion, some strategies that the participants implement on a daily basis to enjoy public space at night also emerged.

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Name (pseudonym)	Age	Nationality	Sexual orientation	Relation to area
Anna	26	Italian	heterosexual	Non resident
Cristina	36	Italian	heterosexual	resident
Silvana	40	Italian	pansexual	resident
Marisol	59	Cuban	heterosexual	resident
Giovanna	60	Italian	heterosexual	resident

Table 3-11 Focus Group in Loreto-Padova participants

The Loreto-Padova district is a complex one, inhabited by different ethnic groups and divided into two areas: one perceived as safer, toward the Rovereto metro, and one perceived as more unsafe, involving the area of Via Padova and Parco Trotter. Although in the latter area the daily life of the participants is greatly affected by incidents of violence and drug dealing, the community dimension of the neighborhood emerged very strongly from all participants.

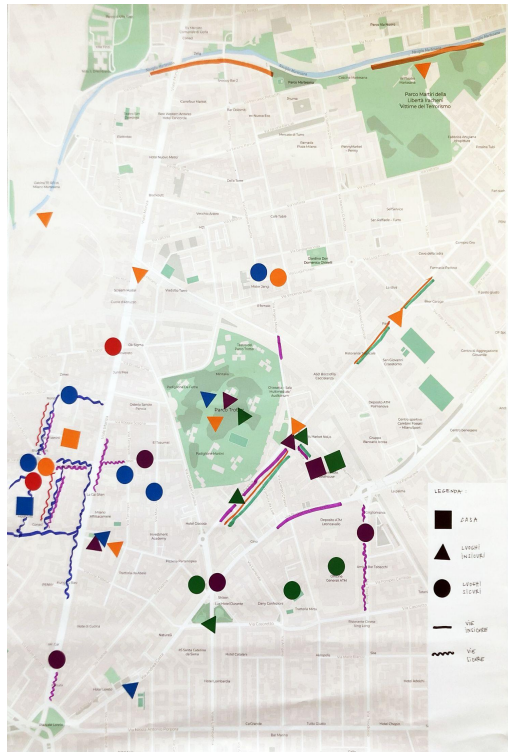

Figure 3-34 Map of the Loreto Padova district with interventions by the participants

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Negative Factors

Leading the way during this first phase of the discussion was the inherent theme of people occupying public space. Particularly, affecting the participants' everyday life is the occupation of public space by male-only groups. The presence of male bodies was considered by several participants as an important factor of discomfort and disturbance in the use of neighborhood spaces. Regarding the criticality of frequentation, the area of Parco Trotter adjacent to Mosso (a hybrid meeting place for mixed events, born from bottom-up initiatives, today a place of attraction for the whole city), near the intersection of Via Padova and Via Arquà, was particularly reported, although all of Parco Trotter is perceived as very problematic. The presence of male bodies during the discussion often intersected with the theme of ethnicity. This emerged through some statements in which other factors, such as substance dealing, were also mentioned. Although the discourse never had an overtly racist or accusatory tone toward other ethnic groups, a veiled unease about the ethnic question emerged from the discussion, potentially accompanied by internalized stereotypes and prejudices, but also simply fueled by a sense of inadequacy towards the unfamiliar. The need for integration between different communities, in order to foster dialogue and create bonds of trust emerged strongly. A key factor in the difficulty of interaction is the language barrier. Among the various places surveyed during this first phase, Via Arquà emerged as central to the discussion because of its complex situation involving people under the influence of substances, vandalism, and incidents of violence. One of the major problems noted by the street's residents is the concentration of male foreign residents without families, with whom it is difficult to have meaningful interactions due to their lifestyles of spending the entire day at work. The lack of households with women and children is a major limitation to building relationships and acquaintances among neighbors.

Mixed Perception Factors

Mixed-perception factors included law enforcement, which for some participants is only a source of discomfort due to falling into the category of "male bodies," as well as not being effective in acting in problematic situations. One participant, on the

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other hand, argued for the effectiveness of law enforcement interventions in conflict situations. Inherent to the theme of the night was the issue of gentrification, which, although recognized as a phenomenon with non-negligible consequences, was considered by one participant as positive regarding its ability to generate situations perceived as safe. However, there was not full agreement on this issue, particularly regarding the presence of many nightclubs.

Positive Factors

Among the positive aspects noted by the participants, the sense of community certainly stands out as fundamental among all residents in the neighborhood. This is complemented by all those aspects that, according to the participants, enable its realization. One of these is the presence of meeting places, such as bars, shops, and clubs. Examples of places with this characteristic are Piazza Morbegno, Piazzale Governo Provvisorio, and Via Teodosio. The presence of bars and clubs was considered as a positive factor especially in the evening and at night. Among the many venues, recognition was given to Mosso for its ability, albeit limited, to create opportunities for meetings. Also considered important were cultural events. Among the factors capable of instilling security, inherent in the size of the attendance, is the presence of the LGBTQIA+ community, defined as "protective." Other elements nominated positively were the presence of street cleaners within Parco Trotter, and the presence of a network of female taxi drivers, who make it easier for women to get home at night in the neighborhood.

Strategies and Proposals

The proposals that emerged in the last part of the discussion mainly focused on Parco Trotter, reflecting the needs expressed in previous phases. Central to the discussion was the issue of male-dominated attendance and occupation of the public space. Given the complexity of this issue, several suggestions were made to address it. Concerning the park, it was suggested to entrust its management to women from the neighborhood and to limit entrances. In addition, increasing the number of events and gathering opportunities was suggested as a way to create a more diverse and populated environment. Furthermore, creating meeting moments and spaces was

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proposed to foster integration among the different foreign communities living in the neighborhood.

3.5.4 Paolo Sarpi

Paolo Sarpi is an area that we have chosen to frame through some structuring axes (see Figure 3-35): Viale Elvezia to the south, Via Francesco Melzi d'Eril to the southwest, Corso Sempione to the west, Via Procaccini to the north, and Via Ceresio and Bastioni of Porta Volta to the East. The focus group in this area focused primarily on the positive aspects, as this area emerged from the data analysis as one of the most positively perceived. Referring to their daily life experiences in the neighborhood, the participants highlighted elements that contribute to their perception of safety.

Name (pseudonym)	Age	Nationality	Sexual orientation	Relation to area
Michela	21	Italian	heterosexual	Non resident
Eleonora	27	Italian	heterosexual	Non resident
Katia	32	Italian	heterosexual	Non resident
Jaylin	34	Chinese	heterosexual	resident
Maria	39	Italian	heterosexual	resident
Carla	59	Italian	heterosexual	resident

Table 3-12 Focus Group in Paolo Sarpi (Chinatown) participants

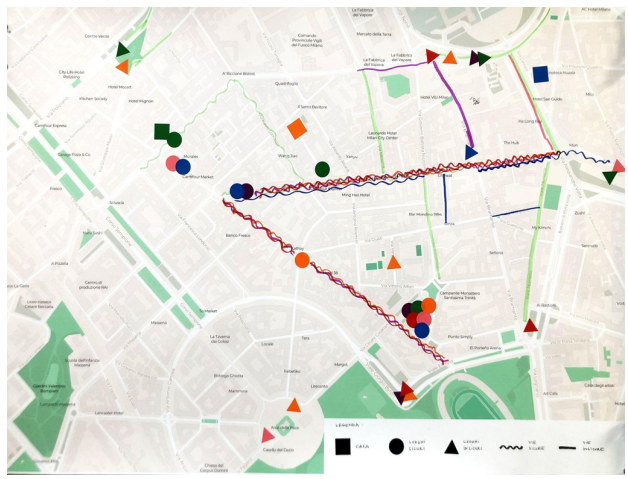

Figure 3-35 Map of the Paolo Sarpi/Chinatown district with interventions by the participants

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They were subsequently asked to analyze the negative aspects that affect their perception of insecurity. Finally, they were invited to reflect on proposals or strategies that are effective in this area and could contribute to improving the perception of other areas of the city.

Positive Factors

Among the factors that emerged as most positive in the Paolo Sarpi area is the liveliness of the neighborhood. Participants unanimously believe it is created and fueled by the presence of people, that is, the fact of not feeling alone in public spaces. The presence of people is favored above all by the presence of meeting places of different kinds, especially places to eat and drink. In some specific places, such as Piazza Cesariano, the fortunate mix between the presence of clubs and the physical conformation of the square with the houses around it and its pedestrian area, makes it perceived by all participants as one of the safest places in the neighborhood.

Bars and restaurants emerged as one of the factors that generates greater safety, along Via Paolo Sarpi mainly, as they ensure that the street is always full of people even after the shops close.

What emerges quite clearly in terms of design of space in a transversal way is the pedestrianization of Via Paolo Sarpi. It generates a greater feeling of well-being both because it favors the presence of people on the street, and because it gives the possibility of being seen and heard in case of need, and because it does not fuel an aggressive attitude like the presence of cars. One particularly valued theme is that of lighting, which emerges both as a positive aspect where present and as a negative aspect where it is missing. In particular, in addition to Via Paolo Sarpi where the lighting is accompanied by the liveliness of the street, other places, such as Piazza Cesariano Square and Via Piero della Francesca, also emerge as particularly virtuous in this sense.

Mixed Perception Factors

Some elements emerged in the discussion as discordant, in the sense that different opinions developed regarding their role in terms of perception of safety in the neighborhood. One of the main controversial themes is the presence of the Chinese

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community: for some, it is a source of security, while for others, it is not relevant. In particular, one element that clearly emerged is the need for cultural integration. In fact, where integration is successful, the perception of safety increases.
Another element on which there have been conflicting opinions is the role of nightlife in relation to the perception of safety: for some, the presence of people on the street is sufficient to elicit a sense of safety, for others, it also depends on the degree of drunkenness, and therefore perceived harassment, of people at night in the premises. Finally, even the presence of the law enforcement officials on the street is perceived differently in terms of safety: for some, it gives peace of mind; for others, it generates anxiety.

Negative Factors

Among the elements that generate a perception of insecurity, the absence of people is perceived as a problematic element, as one does not know who to turn to in case of danger. Another negative element is theft, which is quite frequent in the neighborhood. Physical places that generate insecurity are tram stops, due to the presence of disadvantaged and sometimes drunk men. Some aspects emerged related to the physical conformation of the space and its management. In this sense, parks or the areas surrounding them generate particular discomfort, particularly at night. In addition to the parks themselves it is precisely the dark areas, inside and outside the parks, that cause particular discomfort. In fact, without the possibility of seeing clearly, the fear is fueled in the participants that someone with ill intentions could hide in darkness to attack them. In this sense, inactive or abandoned buildings contribute to generating a perception of physical and social degradation of the area. An element perceived as particularly problematic in terms of safety is the presence of cars. In some areas, in particular, they are seen as a source of danger to physical safety in the event of road accidents, or as a source of potential aggression for fear of being followed and kidnapped, or even when they speed along high-traffic roads as they are not aware of any dangerous situations and therefore do not provide assistance. Finally, when they are parked, they act as a visual obstruction behind which aggressors could hide.

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Strategies and Proposals

With respect to the strategies that are effective in this area and could contribute to improving the perception of other areas of the city, what emerges first and foremost is the creation of places for social gathering that are not limited to the food and beverage (F&B) sector; it is instead proposed to promote the creation of cultural spaces. Furthermore, to address the presence of areas where it is not possible to see potential danger or be seen in case of need, it is proposed to work at the design level of the space by promoting greater transparency. Finally, it is proposed to encourage the use of bicycles by creating cycle paths and protected spaces for bicycles, which are seen as a sustainable mobility strategy from both an environmental and personal safety point of view, as they provide the possibility of quickly moving away from any situation perceived as dangerous.

3.6 Conclusions

In conclusion, the approach adopted in this research contributes significantly to enhancing the understanding of safety factors in urban environments, particularly in the context of space perception, city use, and hotspots. The process of defining and gathering potential proxy indicators, followed by a rigorous selection based on criteria such as Survey Analysis, Spatial Consistency, Temporality, and Representativeness, has resulted in a refined dataset of 23 indicators for more effective statistical spatial analysis. At the same time, the process of defining a list of proxy indicators to accurately synthesize safety factors posed challenges and limitations, particularly in the identification of available datasets specific to the city of Milan. Despite the richness of local and regional open databases, difficulties arose, including the scarcity of proprietary data related to reported crimes on streets related to assault, harassment, robbery, presence of homeless groups and encampments, presence of sex workers / prostitution, carelessness of streets, sidewalks and public spaces (filth, tags, etc.), and social support or perception of anonymity and isolation. The spatial localization of this sensitive data and privacy concerns presented additional obstacles. Nevertheless, despite these challenges, a substantial and relevant list of datasets

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emerged following a rigorous methodology as described above, providing a foundation for a meticulous spatial analysis in Work Package 4, to be discussed in the following chapter.

The integration of technology through the Wher App, where user accounts are verified and ratings are collected on specific road sections, brings a valuable dimension to the assessment of safety perceptions. The inclusion of various parameters such as time slots, personal safety perception, crowd perception, and lighting perception, along with the option for users to provide free-form comments, enriches the dataset with real-time, user-generated insights. Furthermore, the adoption of Textometric and Sentiment analysis provides a deeper layer of understanding by systematically analyzing textual data. Textual analysis unveils patterns, themes, and relationships within user comments, while Sentiment analysis categorizes the emotional tone expressed as positive, negative, or neutral. The generation of automatic classifiers based on prevalent comment themes, including crowded streets, homelessness, drug activity, poor lighting, sex work, and safety concerns at night, allows for a nuanced exploration of urban safety dynamics. The findings suggest that certain topics are more recurrent and elicit a higher negative sentiment, providing valuable insights for urban planning and safety improvement initiatives. The ability to geographically pinpoint these issues through coordinates enhances the applicability of the analyses to specific urban areas. This multi-faceted approach not only advances our understanding of safety for women in urban spaces but also offers a robust framework for identifying common indicators across diverse urban zones. These insights can serve as a foundation for targeted interventions and policies, ultimately contributing to the creation of safer and more secure urban environments, in order to improve the walkability for women in Milan.

The online survey, which has garnered over 1800 responses from inhabitants and users of the city of Milan, reveals some key findings with respect to women and gender minorities' experiences while walking in the city, especially at night. The findings both confirm assumptions based on previously reviewed literature on the topic as well as highlight new themes, opening up new avenues for exploration on the subject of women's safety in public space, and particularly in Milan. In summary,

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the study revealed distinct safety perceptions between women and gender minorities and men in Milan. The survey confirmed that women and gender minorities feel less safe walking in the city, whether by day or night, compared to men. The survey also showed that the relevance of different safety factors varies between the genders, shedding light on the importance of adopting different approaches when addressing the issue of safety perception for women and gender minorities. The qualitative results of the survey also shed light on additional safety factors that were not considered in the study. These range from personal, subjective factors, such as proximity to one's home, to preconceived notions about the reputation of certain areas. Intersectional analyses reveal links between perceptions of safety of women and gender minorities and age (inverse correlation) and economic conditions (direct correlation). Despite these findings, the survey's limitations in participant diversity, particularly in terms of nationality, ethnicity, and disability, restrict the broad applicability of its results and the full exploration of intersectional dynamics, given that the majority of respondents identified as white (95%), Italian (96%), abled (97%) women (92%). This leads to natural research limitations with respect to understanding the issue from a multidimensional perspective that considers various axes of discrimination. The survey results are however highly effective in showing variances between genders with respect to specific safety factors, which constitute a crucial component of the comparison between what was obtained by the statistical model to be developed in Work Package 4 and the declared importance of each factor with respect to the perceived safety.

The development of the three focus groups in the selected areas of the city allowed a qualitative investigation useful to focus on the factors detected in a quantitative form, according to a more personal observation and regarding a heterogeneous target group. Although the results of the focus groups cannot be considered in a statistical form, it is interesting that they allow certain points of view, which would have emerged from the questionnaire in an aseptic and imprecise manner, to be explored in greater depth, such as the issue concerning the perception of acquaintances in public space, or the observation of specific places in the city considered more or less safe. What emerges is an expertise of the participants

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regarding their everyday lives in terms of observing urban dynamics, concerning factors that result in a condition of better security (the sense of community, the presence of open activities, the presence of people of a heterogeneous nature, etc.), and factors that, on the contrary, result in a sense of insecurity (people - mostly men - in an altered state due to substance abuse, chaotic situations in terms of flow, lack of care for spaces, etc.). Expertise is also related to the imaginative capacity for policies and solutions that could make the experience in public space better in those areas that appear to be particularly problematic. It is interesting to note the emerging alignment between sustainable mobility goals and perceptions of safety, highlighted through the consideration of the presence of cars, parked or in motion, and the specification of car-centric environments in particular as hostile and a factor that reduces women+'s sense of safety while walking. Alternatively, pedestrianized areas and areas with decent cycling infrastructure were noted as positive contributors to sense of safety. This result is in line with results emerging from open-ended questions in the survey, which highlighted the role of transport corridors in enhancing or inhibiting women's sense of safety.

Overall, the data collection approach demonstrated in this chapter follows a digital humanities approach that mixes between conventional and digital modes of data production and analysis. The results collected in this chapter provide a solid foundation for the development of a detailed spatial analysis of the perception of safety of women and gender minorities in Milan, which is the focus of "Work Package 4 - Data Analysis and Output Evaluation". The results of the dataset description exercise for location-based data about the city of Milan as well as data regarding the georeferenced votes collected through the Wher App about the perception of safety of women were used to build a GIS statistical model to map women's perceptions of safety and evaluate the relationship between perceived safety and the factors that influence it within the urban environment. In particular, the indicator selection process continued to identify the datasets best fit to calibrate the model and by introducing synthetic datasets to provide a more precise and reliable representation of the safety factors. In addition to this, the Wher App user-provided comments, the survey results and focus group discussions provide further quantitative and

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qualitative insights into factors that influence women and gender minorities' safety perceptions in the case of Milan, which we were able to compare to the predefined list of safety factors identified in previous work packages. The results of this data analysis comparison both confirms the validity of the predefined safety factor list and provides further insights into additional factors that were not considered in the research. The survey results, in particular, also provide a more detailed understanding of the relative weights of each individual safety factor as perceived by people of different genders and other demographic profiles. These outputs help build the framework for a reliable comparison among the outcomes of the statistical model (obtained through the Wher data Appand Location-based data) and the declared importance of each indicator, including profile-specific differences and needs. This mixed data collection methodology allowed the researchers to integrate between quantitative and qualitative insights from large sets of open and proprietary data, as well as compensate for limitations of data in terms of depth and bias. This also allowed for cross-analysis of data, whereby insights from one data type were leveraged to inform and refine the methodology of data collection from another data source. Finally, the data collected through the site-specific focus group discussions, as well as other qualitative data collection tools allowed for deeper qualitative insights, further used in consequent phases of the project to inform policy guidelines for the city of Milan and recommendations for gender-sensitive urban planning principles.

As shown in Table 4-1, each Safety Factor is associated with one or more dataset, or with a synthetic indicator, this was instrumental in identifying the correct data to represent the factors. However, it is important to switch the focus from dataset to indicator and to reconceptualize the table in terms of the indicators. The case of "Count of F&B" is exemplary of this process: the single indicator is built on two datasets (i.e., Food and Beverage Services, and Integrated Food and Beverage Services) and represent three SF_L2 (i.e., Visibility "eyes on the street", Presence of people, and Businesses). The distinction of the two original datasets is not relevant for the next steps, and the SF_L2 representation is ought to be considered as a characteristic of the indicator.

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The consolidated indicators database is extensively describing the urban characteristics that are assumed to influence the perceived safety. The analytical process outlined in this section focuses on the identification of the spatial relation between the indicators and the Wher App Data. More precisely, Figure 3-11 shows the spatial consistency of Wher App Data, which is structured as heterogeneous comment areas defined by the user. In the app, during the scoring process, the user has the possibility to highlight the additional streets to be considered for the same comment, thus each data point has a different spatial consistency, with comments varying from a single segment to several streets.

The main challenge of this step consisted in joining indicators of different spatial structures (e.g., points, lines, census areas, grids, etc.) among each other and with the comments, with the goal of building a single table to utilize as input for the planned statistical analyses. This was approached as a two-step process, similarly to the methodology outlined in Messa (2021), as a way to curb the edge-effect and the MAUP (Modifiable Areal Unit Problem) (Openshaw, 1984). This methodology consists in associating each dependent data point (i.e., *Wher App comments*) with the variables directly influencing the specific comment, in this case the indicators falling in a 30m buffer of each segment highlighted by the Wher App user. Thus, indicators of different spatial consistency are associated with each comment and weighted by the area extension to have an area-agnostic relation among the comments.

The result of the process outlined above is an enriched Wher App Data dataset, with indicators' values associated with each safety score. However, the safety score was structured as categorical data, with the following values: 1 (Avoid), 2 (Be careful), and 3 (Go easy). This data structure was not suitable for a collinearity analysis as the perceived safety values were not continuous variables, therefore the second step of the data aggregation methodology was performed: aggregating multiple comments, and associated indicators' values, on a regular grid. The selected grid was the Uber's Hexagonal Hierarchical Spatial Index (Uber, 2018) at resolution level 9, which has a radius of circa 195m. The spatial predicate considered in this join was the overlap between grid cells and comments, calculating the average perceived safety for each cell and the average indicators' values. Figure 4-2 shows the average perceived safety

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score for each cell, filtering the visualization by the cells which overlaps to more than 3 Wher App Data comments.

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CHAPTER 4

Data analysis and mapping

4.1 Introduction

This chapter focuses on the research activities of the fourth Work Package 'WP4 Data Analysis and Output Evaluation', with particular reference to the Task 4.1 'GIS Analysis and Mapping' (see Table 4-1), whilst the Task 4.2 'Policy and Design Guidelines' is addressed in the final chapter of this publication. WP4 is aimed at identifying challenging areas or neighborhoods in the city of Milan which can serve as samples of analysis to help develop a set of policy recommendations or physical intervention actions aimed at enhancing the level of walkability for women in the city. With reference to the WP4, STEP UP aimed to analyze and compare existing data in order to answer the following research questions:

- Research Questions: Which areas or districts in Milan suffer most from deficiencies in walkability criteria as defined by women living in Milan? What are the main urban characteristics of these hotspots? Is it possible to identify common patterns based on the time-invariant characteristics of the urban settlements?

Specifically, this chapter focuses on the finalization of the GIS analyses and the development of the GWR model and its outputs, bringing together the activities outlined in Chapter 2 and Chapter 3.

4.2 GIS Analysis and Mapping

As outlined above, the activities of Chapter 4 use the framework identified in Chapter 2 and build on the activities performed in Chapter 3. This chapter can be considered as in continuity with the previous one as the finalization of the dataset selection process is the first part of the work presented here. In particular, one of the objectives of this phase was to identify a causal relationship between urban characteristics and perceived safety. The data describing the latter is the dataset acquired with Wher, extensively discussed in 3.3 Wher App Data, and the data describing the former is a collection of proxy dataset able to represent the Safety Factors, outlined in 3.2 Location-based Data.

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The conceptualization of the cause-effect relationship between perceived safety and characteristics of the city is discussed in 2.2 Thematic Literature Review, where several Safety Factors were identified. The translation of these factors in quantitative measures is outlined in 3.2 Location-based Data and presents some limitations. The final output of WP3 was to evaluate the adherence between the selected quantitative datasets and the theoretic definition of each factor. Table 3.5 lists the datasets evaluated with scoring criteria ranging from 1 (distant from the SF definition), to 3 (overlapping with the SF definition).

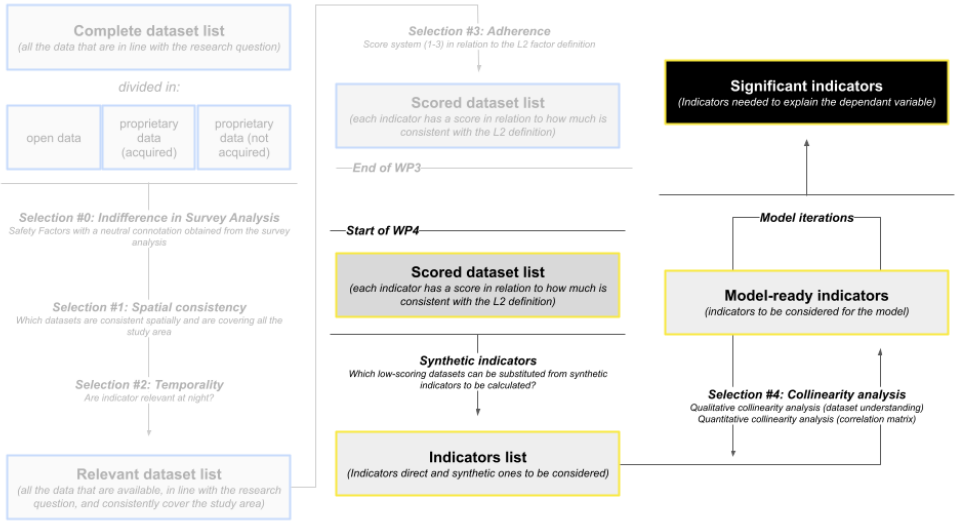

Figure 4-1 Indicator selection flowchart. WP4 activities are highlighted

4.2.1 Proxy Indicator Selection Refinement

As shown in Chapter 3, several datasets have a low adherence score. Some of the factors that emerged as relevant from the literature can hardly be represented by location-based data, since they represent site-specific space configuration characteristics (e.g., Architectural Barriers) or multifaceted phenomena (e.g., Law Enforcement Units). The latter is an example of the limitation that some indicators may have. In the case of law enforcement, the Safety Factor is conceptualized as the presence of agents surveilling the streets, however this information was not available for the scope of the study and just the location of law enforcement headquarters was considered. While the presence of the headquarters anticipates a higher presence of

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patrols and surveillance, it doesn't answer completely to the complexity of the safety factor, hence this indicator has an adherence score of 2.

Synthetic Indicator Introduction

With the objective of improving the adherence to the Safety Factors for the indicators with a score of 1 and 2, the research team explored the introduction of additional data to substitute the low-scoring datasets. This step was separated from the Location-based Data process as the indicators introduced are obtained with different methodologies instead of being a collection of ready-available datasets. Where possible, these synthetic indicators aim at representing more effectively the definition of specific Safety Factors. Table 4-1 shows the synthetic indicators and below a breakdown of the methodology is available.

SF_Level 1	SF_Level 2	Indicators	Synthetic indicators
Spatial Features	Lighting	Count of Public Lighting	-
	Openness	Ability to see and move in all directions	Space Syntax – 300m connectivity
	Visibility "eyes on the street"	Count of F&B	-
		Count of Residential Buildings	Perpendicular residential building curtains
	Obstructions to visibility	Count of Partition Elements	-
		Count of Isolated Trees	-
		Length of Tunnels	Space Syntax – 300m choice
		Length of Bridges	
	Architectural Barriers	Average Distance from Crossings	
	Security devices	Count of Security Devices	-
City Use	Presence of people	Count of F&B	-
		Density of Resident Population	-
		Density of Working Population (on selected Ateco codes)	-
		Strava Metro Flows	-
Hotspots	Transport hub (bus/tram stop)	Count of Bus and Tram Stations	Overground PT frequency
	Railway stations	Count of Railway Stations with External	-

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	Buildings	
Businesses	Count of F&B	-
Spaces of gathering	Count of Discos and NightClubs	-
Parks	Count of Green Areas	-
Open spaces	Count of Abandoned and not Activated Places	-
	Count of Industrial Buildings	-
Law enforcement units	Count of Enforcement Presence	-

Table 4-1 Synthetic Indicators table

As shown in Table 4-1, not all low-scoring indicators were substituted by synthetic indicators. In particular, SF_L2 Obstruction to visibility', with a score of 1 for both datasets, was removed from the indicator list as no suitable alternative was identified. This was the only case of 1-scoring datasets recognized as hard to substitute with a synthetic indicator; all the datasets with a score of 2, even if not substituted, were kept for the following steps.

Openness

The safety factor SF_L2 Openness was translated in the "Ability to see and move in all directions", which was represented by the square meters of road surface available. The adherence score of 1 was assigned because the amount of road surface does not translate effectively the openness of a space, as it doesn't take into account the layout of the area and site-specific conditions. For this reason, an indicator based on the Space Syntax theory (Hiller & Hanson, 1984) was introduced, specifically the VGA connectivity (Turner et al., 2001, Turner, 2003), calculated at a radius of 300m (Messa et al., 2022). Specifically, the VGA was calculated with a resolution of 5 meters, to evaluate the visibility at a high granularity.

Visibility "eyes on the street"

The safety factor SF_L2 Visibility "eyes on the street" was obtained by using three different datasets: the first two are the location of Food and Beverages activities, representing the role that activated shop windows may have on the street, the third was the presence of residential buildings. The latter, with an adherence score of 2,

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was substituted by an analytical output "Perpendicular Residential Building Curtains". In this case, the presence or absence of residential buildings does not describe the location of the facade (and of the windows on the street) as residential buildings can be separated by gardens or other facilities from the public space, or can be designed without a facade bordering the street. For this reason, the quantity of perpendicular residential facades was evaluated, considering the residential buildings' volume in a threshold of 10 meters from the street.

Architectural Barriers

Similarly, the safety factor SF_L2 Architectural Barriers was represented by three datasets (i.e*., Length of tunnels, Length of bridges, and Average Distance from Crossings*). In this case, a single indicator was proposed, which was borrowed from the Space Syntax theories. Since this factor aims at evaluating the opportunity to move and the number of alternatives, a line-based (Lerman & Omer, 2013) measure was introduced, specifically the Choice, calculated at a radius of 300m.

Transport Hub

The safety factor SF_L2 Transport hub (bus stop/ tram stop) was evaluated by the location of the public transport stops. While this is usually an acceptable approximation for most analyses, in this case the focus is on evening and nighttime, resulting in a drastically different service offer. Therefore, GTFS data was utilized to consider the time-variant nature of public transport infrastructure. The General Transit Feed Specification (GTFS) is published by AMAT (Agenzia Mobilità Ambiente e Territorio - Pubblicazione orari del Trasporto Pubblico Locale in formato GTFS) and contains information about each service stop, routes and timetable, allowing for the analysis of specific moments of time. To build this synthetic indicator, each stop was scored by the average headway between 00.00 (midnight) and 06.00 (early morning) during the night of an average working day of October.

As shown in Table 4-1, each Safety Factor is associated with one or more dataset, or with a synthetic indicator, this was instrumental in identifying the correct data to represent the factors. However, it is important to switch the focus from dataset to indicator and to reconceptualize the table in terms of the indicators. The case of

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"Count of F&B" is exemplary of this process: the single indicator is built on two datasets (i.e., *Food and Beverage Services, and Integrated Food and Beverage Services*) and represent three SF_L2 (i.e., *Visibility "eyes on the street", Presence of people, and Businesses*). The distinction of the two original datasets is not relevant for the next steps, and the SF_L2 representation is ought to be considered as a characteristic of the indicator. Table 4-2 shows the data structure to be considered to perform the next analyses.

Indicators	Safety Factor	Safety Factor	Safety Factor	Typology
Public Lighting	Lighting	-	-	Count / sqKm
SpaceSyntax - 300m connectivity	Openness	-	-	Average
Count of F&B	Visibility "eyes on the street"	Presence of people	Businesses	Count / sqKm
Perpendicular Residential Building Curtains	Visibility "eyes on the street"	-	-	Area sum / sqKm
SpaceSyntax - 300m choice	Architectural Barriers	-	-	Average
SOS Devices	Security devices	-	-	Count / sqKm
Resident Population	Presence of people	-	-	Sum / sqKm
Worker Population	Presence of people	-	-	Sum / sqKm
Yearly Night Strava Users Flow	Presence of people	-	-	Average
Overground PT frequency	Transport hub	-	-	Average
Railway Station Buildings	Railway stations	-	-	Count / sqKm
Discos and Nightclubs	Spaces of gathering	-	-	Count / sqKm
Green Areas	Parks	-	-	Area sum / sqKm
Abandoned places	Open spaces	-	-	Area sum / sqKm
Industrial Buildings	Open spaces	-	-	Area sum / sqKm
Police	Law	-	-	Count / sqKm

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Headquarters	enforcement units	

Table 4-2 Indicators/ Safety Factors relation table, with specific on the data typology

Data Aggregation Methodology

The consolidated indicators database is extensively describing the urban characteristics that are assumed to influence the perceived safety. The analytical process outlined in this section focuses on the identification of the spatial relation between the indicators and the Wher App Data. More precisely, Figure 3-11 shows the spatial consistency of Wher App Data, which is structured as heterogeneous comment areas defined by the user. In the app, during the scoring process, the user has the possibility to highlight the additional streets to be considered for the same comment, thus each data point has a different spatial consistency, with comments varying from a single segment to several streets.

The main challenge of this step consisted in joining indicators of different spatial structures (e.g., points, lines, census areas, grids, etc.) among each other and with the comments, with the goal of building a single table to utilize as input for the planned statistical analyses. This was approached as a two-step process, similarly to the methodology outlined in Messa (2021), as a way to curb the edge-effect and the MAUP (Modifiable Areal Unit Problem) (Openshaw, 1984). This methodology consists in associating each dependent data point (i.e., Wher App comments) with the variables directly influencing the specific comment, in this case the indicators falling in a 30m buffer of each segment highlighted by the Wher App user. Thus, indicators of different spatial consistency are associated with each comment and weighted by the area extension to have an area-agnostic relation among the comments (see Table 4-2).

The result of the process outlined above is an enriched Wher App Data dataset, with indicators' values associated with each safety score. However, the safety score was structured as categorical data, with the following values: 1 (Avoid), 2 (Be careful), and 3 (Go easy). This data structure was not suitable for a collinearity analysis as the perceived safety values were not continuous variables, therefore the second step of

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the data aggregation methodology was performed: aggregating multiple comments, and associated indicators' values, on a regular grid. The selected grid was the Uber's Hexagonal Hierarchical Spatial Index (Uber, 2018) at resolution level 9, which has a radius of circa 195m. The spatial predicate considered in this join was the overlap between grid cells and comments, calculating the average perceived safety for each cell and the average indicators' values. Figure 4-2 shows the average perceived safety score for each cell, filtering the visualization by the cells which overlaps to more than 3 Wher App Data comments.

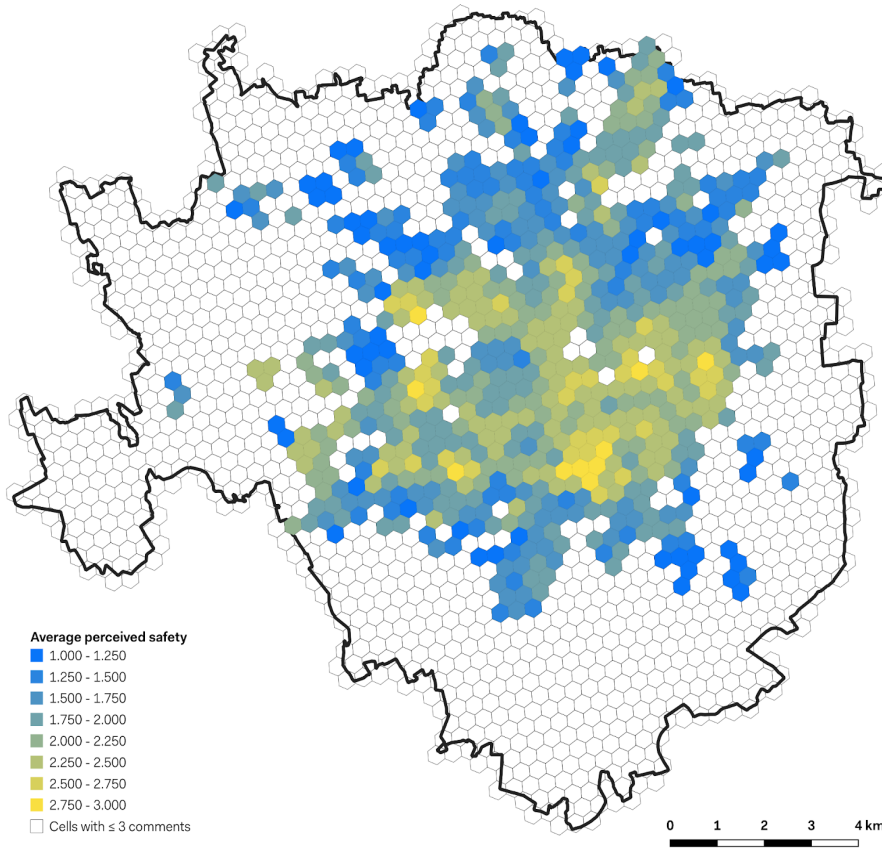

Figure 4-2 Average perceived safety score for each H3 grid cell, filtered by cells overlapping with more than 3 comments

In comparison to a "direct flat join" between all the indicators and the grid cells, the methodology outlined above maintains the hypothesis of a causal relationship

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between the indicators and the perceived safety as each comment is associated with urban data assumed to influence the same comment. On the other hand, flattening all the data on the grid would result in a less precise spatial-relation among the two sets of observations, disregarding the spatial consistency of the Wher App Data. Table 4-3 shows the descriptive statistics of this dataset.

Indicators	Mean	Median	St. Dev	Minimum	Maximum
Perceived Safety	1.905	1.941	0.440	1	3
Number of comments	10.473	8.000	7.208	2	52
Public Lighting	1,988.159	1,754.160	855.171	576.839	7,703.363
SpaceSyntax - 300m connectivity	563.805	565.076	150.419	113.878	1,166.767
Count of F&B	233.462	185.542	167.434	0	1,171.285
Perpendicular Residential Building Curtains	145,133.019	136,185.593	86,670.720	1,529.380	664,034.315
SpaceSyntax - 300m choice	952.011	898.482	334.430	322.136	2,474.711
SOS Devices	1.815	0	7.611	0	85.163
Resident Population	19,094.621	19,089.291	9,244.380	184.933	55,834.066
Worker Population	755.023	585.253	655.203	57.431	5,985.288
Yearly Night Strava Users Flow	50.511	28.685	76.529	0.171	655.440
Overground PT Frequency	4.393	4.238	2.236	0	11.987
Railway Station Buildings	0.464	0	2.236	0	49.949
Discos and Nightclubs	6.448	2.285	14.853	0	177.743
Green Areas	653,322.884	495,963.951	535,339.343	23,483.675	4,825,665.380
Abandoned places	78,102.123	1,342.569	550,103.180	0	11,934,862.650
Industrial Buildings	46,852.166	11,677.293	84,994.994	0	530,061.748

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Indicators	Mean	Median	St. Dev	Minimum	Maximum
Police Headquarters	1,023	0	3,732	0	56.712

Table 4-3 Descriptive statistics of the H3 grid dataset

Collinearity Analysis

The H3 grid dataset (see Figure 4-2 and Table 4-3) includes the average perceived safety score and the average values for the SF_L2 indicators. In order to preliminary evaluate the relationship between the Wher App Data and the other indicators, and among the indicators, a correlation analysis was performed. This process highlights a potential causal relation between each indicator and the perceived safety and explores if any indicator is co-varying with any other indicator, paving the way for the following statistical analyses. Figure 4-3 shows the results of this analysis.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Wher Score	1.000																
2	Public Lighting	0.211	1.000															
3	SpaceSyntax - 300m connectivity	0.187	0.159	1.000														
4	Count of F&B	0.404	0.334	0.200	1.000													
5	Perpendicular Residential Building Curt	0.433	0.252	0.080	0.744	1.000												
6	SpaceSyntax - 300m choice	0.319	0.471	0.245	0.484	0.487	1.000											
7	SOS Devices	-0.112	0.441	0.047	0.061	-0.062	0.174	1.000										
8	Resident Population	0.074	-0.265	0.095	0.275	0.435	-0.029	-0.214	1.000									
9	Worker Population	0.415	0.558	0.205	0.739	0.713	0.615	0.126	-0.037	1.000								
10	Yearly Night Strava Users Flow	0.030	0.446	-0.064	0.094	0.016	0.070	0.566	-0.245	0.139	1.000							
11	Overground PT Frequency	0.067	0.068	0.495	0.252	0.203	0.228	-0.004	0.193	0.182	0.073	1.000						
12	Railway Station Buildings	-0.131	-0.014	-0.078	-0.064	-0.132	-0.096	-0.016	-0.171	-0.065	-0.041	-0.135	1.000					
13	Discos and Night Clubs	0.097	0.258	-0.063	0.481	0.274	0.162	0.031	-0.002	0.274	0.143	-0.060	0.108	1.000				
14	Green Areas	-0.252	0.071	-0.122	-0.351	-0.426	-0.179	0.375	-0.298	-0.309	0.409	-0.018	-0.055	-0.028	1.000			
15	Abandoned places	-0.151	-0.112	-0.094	-0.079	-0.147	-0.141	-0.028	-0.148	-0.097	-0.052	-0.131	0.633	0.098	-0.024	1.000		
16	Industrial Buildings	-0.249	-0.275	-0.108	-0.137	-0.230	-0.238	-0.112	-0.090	-0.219	-0.111	-0.083	-0.043	-0.070	-0.049	0.054	1.000	
17	Police Headquarters	-0.085	0.008	-0.057	0.023	-0.046	0.008	0.026	-0.132	0.023	-0.021	-0.098	0.706	0.176	-0.040	0.537	-0.043	1.000

Figure 4-3 Collinearity analysis results

The first column of Figure 4-3 shows the correlation coefficient between the average Wher score and each indicator, informing on the direction (positive or negative) and on the strength (from 0 to 1) of the correlations. This preliminary result allows the identification of tentative indicators that are directly or inversely related to the perception of safety. This information is crucial to inform the next steps of the analysis as it provides a high-level understanding on how this dataset is shaped. As an example, three indicators appear as moderately positively correlated with the Wher score, namely: (*i*) Count of F&B; (*ii*) Perpendicular Residential Building Curtains;

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and (*iii*) Worker Population. While this is an interesting consideration, it is important to cross-check this with the other columns, where we can see the correlation between each indicator. In this case, the three indicators are strongly correlated between each other (Count of F&B - Perpendicular Residential Building Curtain r=0.744; Count of F&B - Worker Population r=0.739; and Perpendicular Residential Building Curtain - Worker Population r=0.713). This shows how these three indicators, in their spatial consistency, have a co-variant nature, meaning that the densities of this characteristic follow a similar pattern. This phenomenon is not generalizable as it depends on the urban environment, the city's history and economics, but a relation between dining venues and number of workers can generally be expected in European cities. These kinds of considerations are crucial to define an effective modeling framework, as it allows us to bridge the gap between the abstraction of a statistical model and the reality of the data we are considering.

4.2.2 Geographically Weighted Regression Methodology

The indicators outlined above are the result of a process started from the dataset identification and progressive selection of the appropriate data to effectively represent the Safety Factors. As shown in Figure 3-1 and Figure 4-1, once the model-ready indicators are finalized, the definition of the statistical model is based on an iterative process which tests different combinations of indicators and approaches to get to the most reliable result. As part of the first selection process, each dataset was tested in relation to the spatial autocorrelation (Anselin, 1995; Moran, 1948), calculating the Global Moran's I value. The results of this process are vary, but in general shows a tendency toward the absence of complete spatial randomness, which is a known general phenomenon as per the Tobler's First Law of Geography (Tobler, 1970), and a local characteristic already studied by the research team (Abdelfattah, 2022). This consideration, and the results of the collinearity analysis (see Figure 4-3) nudged the selection of the statistical model toward the GWR (Brunsdon et al., 1996; Fotheringham et al., 2002).

The Ordinary Least Square (OLS) regression model (see Equation 4 1) fits a formula based on the explanatory variables (xn) to predict the dependent variable (y). The

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coefficients of each predictor can be interpreted as weights of each factor, showing the importance and the direction (negative or positive) in relation to the y. As appears from the formulation, this is a global model, meaning that all the data points are used to calculate a single fitting equation.

Equation 4-1 Ordinary Least Square (OLS) regression equation.

$$y = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + \epsilon$$

Being a generalized global model, the OLS results in a static definition of the weights of the significant variables, with no spatial variability, opening its application to two major issues: (*i*) multicollinearity, and (*ii)* spatial autocorrelation. As seen in Figure 4-3 several indicators are correlated with each other, varying together in the same or opposite direction. This is not compatible with a regression equation, therefore an iterative selection of a subset of indicators is required, exploring which ones are able to better predict the *y*. Similarly, the spatial autocorrelation can be addressed by selecting data that's less clustered and with a more random distribution.

In this framework, the GWR was selected as the statistical model to cope with the spatial autocorrelation patterns of the predictor variables. As shown in Equation 4-2, this model has spatial-varying coefficients that enable the fitting of a regression equation for every feature in the dataset.

Equation 4-2 GWR equation

$$y_i = \beta_0(u_i, v_i) + \sum_{j=1}^{m} \beta_j(u_i, v_i) X_{ij} + \epsilon$$

This formulation can be regarded as the single equation, which is part of a collection of local models based on each hexagon cell and neighbors, and it provides a spatial-varying predictive result, more suitable for urban data analysis than a static model.

GWR Data Preparation

The Indicator List (see Table 4-1) and the results of the collinearity analysis (see Figure 4-3) are the starting points of the GWR model definition. To further ease the iterative process of significant indicator selection, a data preparation was conducted,

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looking at the consistency of each indicator, similarly to the process outlined in Chapter 3. Specifically, this analysis was structured in a way that would anticipate the limit and opportunities of the GWR methodology. In particular, being based on the hexagon cell dataset, the model takes into account each cell with its predictors to define a local regression, this means that the availability or absence of certain variables may influence the result of the model. While a varying density is normal in indicators that are widespread in the city with cells differing for the variation of the underlying data, other variables are sparsely available and may have a larger scale effect which is outside the specification of the GWR. An example of this indicator is the Railway Station Buildings, which represent the overground railway stations and accounts for 17 points in the whole municipality area. In this case, even if the dataset fulfills the requirements highlighted in Chapter 3, the indicator is not suitable as a predictor for the GWR as its spatial nature is too sparse to be an input for a city-wide model. Following the same logic, four indicators were excluded a-priori as input for the GWR model, namely (*i*) SOS Devices, (*ii*) Railway Stations Building, (*iii*) Discos and NightClubs, and (*iv*) Police Headquarters.

In addition to the dataset shown in Figure 4-2, the data preparation process and preliminary tests conducted with the GWR tool of ArcGIS Pro[25], three additional data points were added to the model set, reaching a total observation number of 675 hexes. The added cells are located in the southern part of the city area and have been considered consistent to the rest of the dataset (in line with the average values and without outliers). The reason behind this modification is the need to build local models with reliable predictive power in the southern portion of the city territory, which is predominantly agriculture-oriented and without a consolidated urban fabric.

Supervised Stepwise Indicator Selection

The remaining 12 indicators were implemented in a supervised stepwise regression procedure aimed at iteratively selecting the predictive variables and models best able to find the best fitting model. Starting from the result obtained from the collinearity

[25] See: ArcGis Pro Version 3.1.0

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analysis (see Figure 4-3), this process was based on the selection of variables with low covariance, with the goal of identifying the higher number of indicators and the most reliable model. Moreover, this process focused on the selection of the correct number of neighborhoods. The GWR constructs separate equations for each feature by taking into account the neighboring cells, the specification of the local models is a user input and depends on the data structure and the final objective. In this case, the data aggregation methodology outlined above produced a set of data reliably explaining the proximity causal relations between the predictors and the dependent variable, so a k-neighbors with a gaussian local weighting scheme was implemented. Each model was tested with multiple k values, evaluating each model based on the selected indicators and the number of considered neighborhoods.

Iteration	AdjR²	Neighbours	Indicator 1	Indicator 2	Indicator 3	Indicator 4
1	0.725	2	Overground PT Frequency	-	-	-
2	0.725	4	Overground PT Frequency	SpaceSyntax - 300m connectivity	-	-
3	0.766	2	Overground PT Frequency	Public Lighting	-	-
4	0.755	4	Overground PT Frequency	Count of F&B	-	-
5	0.769	4	Overground PT Frequency	Count of F&B	Industrial Buildings	-
6	0.672	8	Overground PT Frequency	Count of F&B	Green Areas	-
7	0.763	4	Overground PT Frequency	Count of F&B	Abandoned places	-
8	0.760	6	Overground PT Frequency	Count of F&B	Public Lighting	Abandoned places
9	0.792	4	Overground PT Frequency	Count of F&B	Public Lighting	-
10	0.706	8	Overground PT Frequency	Count of F&B	Public Lighting	SpaceSyntax - 300m connectivity
11	0.782	4	Count of F&B	Public Lighting	SpaceSyntax - 300m	-

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					connectivity	
12	0.689	8	Count of F&B	Public Lighting	SpaceSyntax - 300m connectivity	Worker Population
13	0.770	6	Overground PT Frequency	Count of F&B	Public Lighting	Industrial Buildings
14	0.678	8	Overground PT Frequency	Count of F&B	Public Lighting	SpaceSyntax - 300m choice
15	0.705	8	Overground PT Frequency	Count of F&B	Public Lighting	Green Areas
16	0.778	4	Count of F&B	Public Lighting	Green Areas	-

Table 4-4 Stepwise regression model selection, the final model (model 9) is highlighted in bold

The main two metrics used to evaluate the performances of this process were the adjusted R^2 ($AdjR^2$) value and the Akaike Information Criterion (AICc) (Gollini et al., 2015). Table 4-4 shows the iterations of this process, with the selected model specifics.

As shown in Table 4-4, model 9 is the best $AdjR^2$ result (0.792) and it is based on a 4-neighbors local model specification, with three significant indicators: (*i*) Overground PT Frequency, (*ii*) Count of F&B, and (*iii*) Public Lighting. As the AICc (98.582) compares well with the other models, this is the iteration selected for the following steps of the analysis.

Prediction Location Definition

The GWR model was selected both to explore the causal-relationship and the potential explanatory power of the predictors, and to build a predictive model able to assess the perceived safety score in the whole city. As the initial Wher App Data was limited to a portion of the city, many communities were not mapped, expanding this information by implementing statistical analyses emerged as one of the project's main goals. Conceptually, the GWR model is calibrated on the locations where the indicators and the Wher App Data are available and then it is used to predict the Perceived Safety at different locations.

Perceived safety is a complex topic, which is influenced by several variables explored in Chapter 2. The availability of the granular data assessed in Chapter 3 and refined

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in this Chapter led the research group to identify in the street segment level the correct disaggregation unit to define the prediction location, with the secondary goal of producing an output comparable to the starting Wher App Data input. Specifically, the simplified street network of Milan was used as a map unit, and each segment was enriched with the data representing the indicators. Moreover, to consider the area-effect of the indicators on the street segments, a series of 150m isometric catchment areas was computed, starting from a random spatial array of 10,887 points in the municipality's area. Each isochrone was joined with the indicator data following the same approach described in the data aggregation methodology and was used as prediction location for the GWR model. The Perceived Safety score predicted by the GWR model on each point was associated with the isochrone originating from the same point, resulting in a series of overlapping areas on the whole network. The final predicted network was an averaged version of the isometric buffer on the single segment.

4.2.3 Model Diagnostics

The process outlined in the previous sections resulted in a reliable generalized model based on three significant indicators, which were used to predict the Perceived Safety on the complete Milan street network. This section focuses on the predicted values and results specifications, exploring the spatial-variation of the R2 value, the Beta coefficients, and their relation. Figure 4-4 shows the predicted values before the averaged join with the network segments, showing the overlap of the isometric areas and a qualitative comprehensive view of the results.

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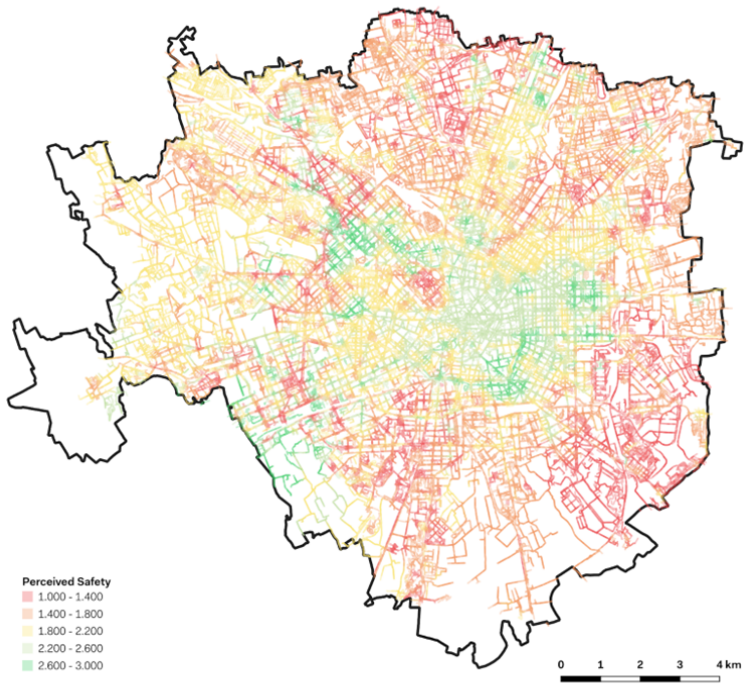

Figure 4-4 Predicted Perceived Safety visualized on the isometric areas. This figure does not take into account the local reliability of the model (local R2 values).

Result Discussion

Being a spatial-variant model, one the GWR output is the local value of R^2, which evaluates the consistency of local regression equations in relation to the ground-truth data. The resulting network dataset, obtained by averaging the isometric areas on the simplified network segments, has a Local R^2 varying from 0.443 to 0.925, with a mean value of 0.746 (see Figure 4-5).

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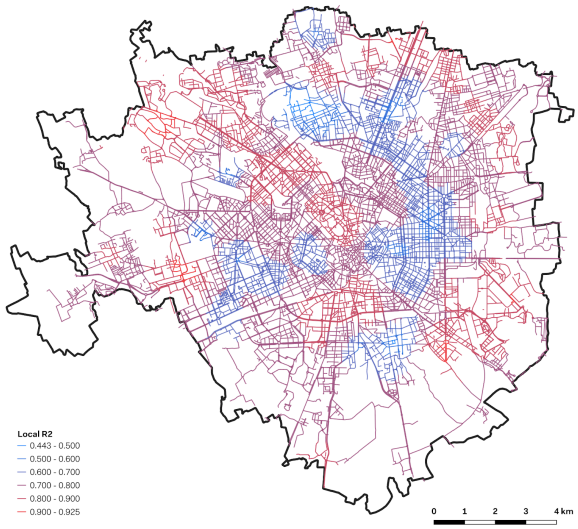

Figure 4-5 GWR Local R^2 visualized on the network

Given the nature of the topic, a conservative Local R^2 value (0.700) is considered as the acceptable threshold for the following considerations. The portions of the network with a lower Local R^2 are excluded from the Beta coefficient evaluation, but will be discussed in terms of future work potentiality.

In addition to the spatial variation of the R^2 value, each local regression is characterized by specific Beta values, as seen in Equation 4 2. Differently from the Local R2, which has a constant nature across the analysis area, the Beta values vary widely in their consistency, therefore the proposed interpretation is relative to the positive or negative direction. Figure 4-6 shows the spatial variation of the Beta coefficient of the three significant indicators as positive or negative, with the interpretation that a positive direction means that an increased quantity of the predictor would result in an improved Perceived Safety score. The three significant indicators are (*i*) Public Lighting (presence and maintenance of adequate lighting systems), (*ii*) Public Transport (frequency of street-level public transport services at night), and (*iii*) Food & Beverage (presence of food and drinks destinations at night).

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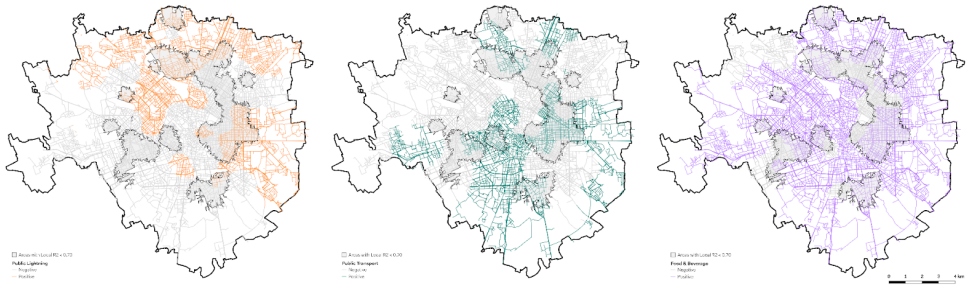

Figure 4-6 Spatial variation of the Beta values of the three significant indicators. Areas with Local R^2 < 0.7 are highlighted.

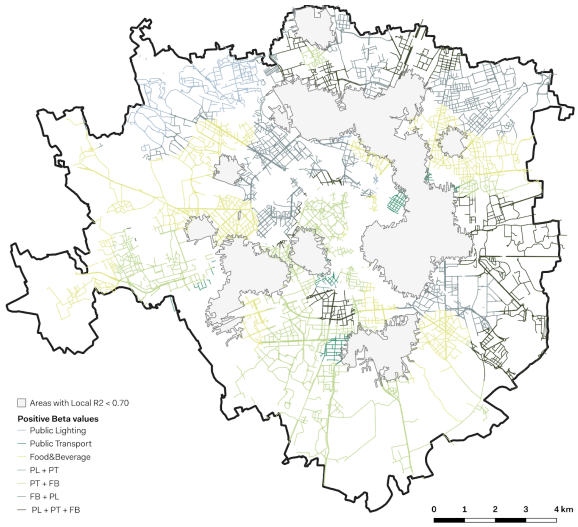

Figure 4-7 Local Beta values overlap on areas with low Safety Score (≤ 2.2) and high model reliability (local R^2 ≥ 0.70)

The interpretation proposed for the Beta values opens the discussion around the understanding of the safety perception in Milan. Considering the model specifics outlined in this chapter, namely the Local R^2, the Beta values, and the predicted values, it is possible to analyze the relationship between these quantities and define an improbable city. The threshold for the Local R^2 is already discussed and is set at 0.7; the Beta values have a positive or negative direction that vary spatially and can inform which element can be improved, the predicted values (Safety Score) varies between 1 (Feel very unsafe) to 3 (Feel very safe).

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The threshold considered for this factor is set at 2.2, which stresses the importance of working on areas that are somehow safe, but can be seen as dangerous by more vulnerable users. Figure 4-7 summarizes these considerations in a single map, showing the overlapping positive Beta values in the areas with a low Safety Score and a high model reliability.

4.2.4 Model Interpretation

The GWR model developed for this study aims to predict the Safety Score (i.e., the perceived safety) by fitting spatial-variant regression equations using the dependent variable of Wher App Data and three predictors based on the indicators outlined in Chapter 3. The three significant indicators are (i) Public Lightning, (ii) Public Transport, and (iii) Food & Beverage, these are conceptualized as proxy data to represent the complex Safety Factors discussed in Chapter 2. The reduction of the SF_L2 in simpler indicators is a step required to develop a statistical model, where a simplification and standardization of the factors is needed, but the same reduction needs to be critically interpreted when utilizing the model as a predictive tool. The three indicators are proxy for different Safety Factors (see Table 4-3), specifically: Public Lighting is proxy for Spatial Features (SF_L1) - Lightning (SF_L2), Public Transport for Hotspots (SF_L1) - Transport hub (bus stop/ tram stop) (SF_L2), and Food & Beverage for Spatial Features (SF_L1) - Visibility "eyes on the street" (SF_L2), City Use (SF_L1) - Presence of People (SF_L2), and Hotspots (SF_L1) - Businesses (SF_L2). The relation between the indicators and the Safety Factors needs to be kept in mind as the correct interpretation of the model Beta values is not in the data per se, but it is related to what it represents. In the case of Food & Beverage, the indicator shows the areas where open businesses at nighttime may attract the presence of people, which increases the perception of safety of women+ related to the possibility of receiving social support, albeit from strangers, rather than a feeling of desolation and isolation. In addition to this, it is interesting to critically examine the Local R2 variation. Having large areas of Milan where local regressions have a lower reliability could mean that the predictor variables are not enough to explain the local Wher App Data variability. In respect to the complete list of Safety Factors, just

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five entered the model as significant indicators, therefore areas where complex city use factors or specific built-environment elements have a high impact on perceived safety can hardly be represented by the developed model. Finally, it is important to note relevant data and methodological limitations of the GIS model, which naturally has an impact on the level of completeness and accuracy of the final mapping result. The main limitations are the following: the limited coverage of Wher App data and limited diversity in the demographic profiles of the users (mostly falling in the 18-25 years age group); the limited open data available about the city to reflect the full list of safety factors (SF_L2) and the limited measurability of some of them; and finally, the inherent limitations of the proposed quantitative approach, which is driven by the need to reduce complex socio-spatial phenomena into numbers. For this reason, it is important to review these results as part of an extended research that relies on mixed methodologies, both quantitative and qualitative, to address key safety perception challenges in the Milanese urban context.

4.2.5 WebGIS development

The outputs presented in this chapter are meant to formalize the relation between the perceived safety, the data describing the city and the physical environment. Some of the processes outlined above have the twofold objective of improving the spatial data science methodology of subjective perception phenomena, and of building a more profound and comprehensive understanding of the city of Milan. These two goals are translated into two WebGIS platforms, in order to allow users to explore the results and follow the methodological steps of the project. The first WebGIS platform is the Safety Index Map, the second is the Interactive WebGIS presented in Chapter 5.

Safety Index Map

The first WebGIS is the Safety Index Map[26] (see Figure 4-8) shows the results of the GWR model without proposing an interpretation. Specifically, this platform allows for

[26] See: https://app.transformtransport.org/stepup/safety-index.html

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the exploration of the Safety Index, which varies between 1 and 3, and the Local R2 on each street segment. Moreover, additional functionalities were included in the app, specifically the possibility to filter the results geographically and by values. The statistics are calculated in relation to the selected street segment, allowing for a direct comparison of different urban geographies, in this case the larger local administrative boundaries (i.e., *Municipio*).

In addition to this, it is possible to directly explore the Local R^2 variation, by selecting an alternative map visualization. This map offers three filters, which are in line with the researcher interpretation of the R^2 values, confirming the model calibration with values higher than 0.7.

Figure 4-8 Screenshot of the interactive Safety Index Map

4.3 Output evaluation

The Output Evaluation section consists of the comparative analysis of results derived from different processes of the project including GIS Analysis and Mapping, Survey and Focus Groups. The STEP UP project, as previously described, focuses on a variety of data collection methods based on very different dataset and data sources, both

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quantitative and qualitative. Consequently, the obtained results are equally varied and informative of different aspects of the topic and are often complementary to one another. The Output Evaluation section seeks to analyze, through a comparative approach, specific data analysis and results that are generated from different methodologies and that are described both in Chapter 3, concerning the analysis of the results from the online survey and the focus groups, and in Chapter 4, concerning the analysis of the results of the GWR Model.

As a comparative baseline for the analysis of the data obtained and described un until now in the book, the context considered within this section is the following: the timeframe is limited to nighttime perception of safety, the demographic group is women and gender minorities and the spatiality is addressed in two ways, the first being general to the city of Milan and the second being location-based at neighborhood scale.

General Results

General results are evaluations made about the city of Milan as a whole and are informed by the GIS analysis and mapping described in Chapter 4, and by the online survey and focus groups described in Chapter 3. In particular, the general results focus on the role that specific urban elements play within the phenomena of perception of safety at night for women and gender minorities.

Safety Indicators Relevance in Milan at Night

The influence that specific urban elements have on the perceived level of safety at night for women and gender minorities is a recurring topic within this research and one of the most important aspects of the project, particularly because it has the potential to inform on constructive and structural changes when referring to urban planning and spatial design. This topic was addressed through both quantitative and qualitative approaches, the first being the GIS analysis and mapping and the Online Survey, the second being the Focus Groups.

The GIS Analysis and Mapping process identified three significant indicators out of the Safety Factors identified in Chapter 2. These indicators are represented in Figure 4-6 and Figure 4-7 and are (i) Public Lightning, (ii) Public Transport, and (iii) Food

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& Beverage. As extensively discussed in the previous section the proxy data used in the GWR model need to be referred to the original Safety Factor definition for a correct interpretation. The factors are a conceptualization of complex phenomenon and can be interpreted in the following way:

- Public Lighting: the design of streets and public spaces should include the presence and maintenance of adequate lighting systems in order to guarantee a higher awareness of one's surroundings and consequently a higher perception of safety of women+ while walking at nighttime;
- Public Transport: the enhancement of public transport at nighttime will make bus and tram stops into more attractive elements of the urban environment, thus drawing more attention and resulting as more recognizable hubs;
- Food & Beverage: open businesses at nighttime attract the presence of people, which increases the perception of safety of women+ related to the possibility of receiving social support, albeit from strangers, rather than a feeling of desolation and isolation.

From a quantitative perspective, the translation of a complex phenomenon in hard data is a necessary step to enable the development of a statistical model. This process leads to evident shortcomings in the statistical analysis, which appears as low Local R^2 values: areas where the regression equations do not reliably fit the Wher App Data. In order to properly model these areas, additional data would need to be considered, introducing fine-grained information about city use and built environment characteristics.

The Online Survey presented specific questions regarding the relevance of urban elements related to perceived safety, through the use of the Likert Scale, which made it possible to understand not only the relevance or neutrality, but also the direction of the relevance, whether positive or negative. The analysis of ratings provided by women and gender minorities for each safety factor, as depicted in Figure 3-45, reveals insights into the connotation and relevance of these factors. When a majority of ratings align at 3 (neutral), the safety factor is perceived as irrelevant to the overall safety perception, this trend is observed for factors such as "equipped squares" and "presence of recognizable charging points for smartphones". The safety factors which

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resulted most positive for perceived safety are "presence of open commercial activities" and "presence of police stations/patrols", followed by "having a wide field of vision", "presence of efficient lighting system", "presence of recognizable open gathering centers", "presence of escape routes", "presence of emergency call devices", "ability of being seen by other people". The most negatively perceived safety factors are "being in a disused urban area", "presence of drugged/drunk people", "presence of only men", "harassment endured by yourself of others", "being in a large open-air car park", "presence of drug dealing activity", "being near/inside a railway station", "negative reputation of the location".

The qualitative analysis provided by the Focus Groups, showed the participants' profound understanding of the urban environment, particularly in observing dynamics that influence perceived safety levels. The factors that emerged as particularly relevant are mostly linked to the city use, a strong sense of community and the presence of diverse individuals contribute to a higher level of perceived safety, whereas the predominant presence of men, or the presence of substance abuse are recognized as influential in a perception of unsafety. Some safety factors that aren't directly part of the city use also emerged, the main one is the presence of commercial and open activities (which emerged as particularly positive and significant in the Sarpi neighborhood) and also the neglect of public space as something negative.

Among the various datasets collected and analyzed through diverse methodologies, a recurring theme is the identification of human behavioral patterns, with a particular emphasis on the presence of people as a critical determinant of perceived levels of safety, particularly in the Survey and the Focus Groups. This recurring aspect underscores the significance of city use in shaping perceptions of security within urban environments. In this context it is important to address the complexity of the concept of "presence of people", which is generally referred to generically, which entails a more nuanced interpretation, or it is articulated in more specific subcategories, traditionally related to a perception of unsafety, i.e. "presence of only men", "presence of racialized people", "presence of drugged/drunk people". These factors are not easily quantifiable as they are variable over time and in space, and they set in relation to existing complex societal and urban dynamics which could

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become the subject of future research. However the presence of people, or specific subcategories of people, is also intrinsically linked to quantifiable urban elements. It is interesting to notice how some of these elements resulted in being relevant within the GIS Mapping and Analysis stage, for example the operation of commercial activities during nighttime hours or the frequency of public transportation systems at night. All these levels of information combined suggest that active and populated spaces contribute substantially to the overall perceived security in urban settings, however a more vertical approach is necessary to better determine the specificities of city use in relation to perceived safety.

Location-based Results

Location-based results are evaluations made about specific areas of the city of Milan, mainly at a neighborhood level. These evaluations are informed by the GIS analysis and mapping described in Chapter 4 and by the data provided by the online survey and described in Chapter 3. In particular, the location-based results focus on women and gender minorities' perception of safety in certain areas of Milan at night, in order to provide a detailed assessment of areas that are generally perceived as safe and unsafe.

Perceived Safety in Areas of Milan at night

The data on perceived safety for women and gender minorities at night in the city of Milan provides valuable insight into complex urban dynamics and perceptions, however it is crucial to approach it with caution and critical thinking due to inherent biases. It is essential to recognize the fact that perceived safety doesn't necessarily align with actual safety levels. The focus of this evaluation isn't to identify no-go zones, but rather to recognize positive cases and examples in Milan and emphasize areas that require prioritized attention compared to others. By acknowledging the limitations of perception-based data it is possible to still use it to better understand the nuances of human experiences within the urban environment.

The GIS analysis process of the Wher App Data and the GWR model resulted in the analytical maps shown in Figure 4-4, Figure 4-5, Figure 4-6, and Figure 4-7, and in the Safety Index Map (Figure 4-8). These outcomes are tools to explore the Perceived

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Safety levels of Milan and analyze relative variations of this measure. Whilst an interesting interpretation of these results is discussed in the previous section, it is possible to look closely at the spatial distribution of the Safety Index Map and compare how the different urban areas compare. Moreover, the Local R2 map shows areas where the regression equations are less calibrated, these areas are considered as complex parts of the city, where additional and more refined analysis are required. For a critical interpretation of the quantitative process, the Interactive WebGIS (see Figure 4-9) comes in hand, as it covers in a transversal way the relation between Safety Factors, indicators and specific places, linking the abstract data-driven representation of locations and its reality, by coupling Wher App scores, indicators' values and street-level pictures. This tool offers a guided explanation of the thought process, enabling the end user to appreciate how diverse the Milan urban environment is in terms of perceived safety.

When addressing specific neighborhoods in Milan, the Online Survey requested the perceived level of safety according to residents in their own neighborhood. This means the resulting perception level is determined by the fact that the respondent women and gender minorities are familiar with the area, identified through specific CAPs or postal codes. According to the analysis of the data regarding the most recurring CAPs (with at least 50 respondents) the perception of safety within the neighborhood varies significantly. Inhabitants of the areas encompassing Stazione Centrale and Stazione Garibaldi (20124), as well as Loreto and via Padova (20127), tend to hold notably negative views regarding perceived safety. Conversely, residents in CAPs that cover Porta Romana (20135) and Porta Genova/Porta Magenta (20144) generally perceive their surroundings more positively. The remaining CAPs exhibit a predominantly positive perception of safety, with the exception of the CAP that includes the area of Casoretto (20131), where perceptions are characterized as neutral.

In most cases, the perception of safety reported through the Safety Index Map coincides with the reporting of specific neighborhoods by their residents in the Online Survey, although it's important to note that the latter is characterized by a generally high number of neutral votes, whereas the votes on the Safety Index Map are a result

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of Wher App votes, which, as previously mentioned, don't consider a neutral perspective and have been collected as an average. Whilst CAPs 20123, 20133 and 20135 are perceived as mainly safe in both datasets results, CAP 20144 is perceived as generally safe from its residents, whereas Wher App users have a more unsafe perception of the neighborhood, this includes the area of Navigli, particularly lively at nighttime in some streets as opposed to others which can become quite deserted. CAPs 20129, 20131, 20146 and 20154 are perceived as mainly neutral by residents, but with a generally higher amount of positive votes than negatives. The Safety Index Map offers some different insights, for example the CAP 20129, also known as the area around Risorgimento and Porta Venezia seems to be perceived generally as quite a safe area, whereas CAP 20154, zona Sarpi, has a higher amount of variations within it presenting areas perceived as very safe, near the pedestrian street, and areas perceived as more unsafe towards Parco Sempione. As for the areas which are perceived as unsafe by residents, CAPs 20124 and 20127, zona Centrale and via Padova respectively, the Safety Index Map mainly confirms these results, apart from a slightly more neutral perception of the area in front of Stazione Centrale.

4.4 Conclusions

The activities detailed in this chapter further stress the intricate relationship between urban characteristics and perceived safety, demonstrating the necessity of a multifaceted approach to urban planning. By employing proxy data and synthetic indicators, the statistical methodology offers a nuanced understanding of how specific urban elements such as public transport frequency, food and beverage services, and public lighting contribute to residents' feelings of safety. The use of Geographically Weighted Regression (GWR) allowed for a spatial-variant analysis, highlighting the importance of considering local variations rather than relying on a one-size-fits-all model. This approach not only identifies the key factors influencing perceived safety but also provides a replicable methodology for future studies aiming to explore similar urban phenomena.

The findings emphasize that perceived safety in urban environments is a complex construct influenced by various interrelated factors. For instance, the correlation

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between food and beverage services, residential building layouts, and worker population densities suggests that active and populated areas contribute significantly to a sense of security. Additionally, the study highlights the limitations of using traditional datasets alone, as some safety factors such as law enforcement presence and architectural barriers are not adequately captured by readily available data. This gap necessitated the creation of synthetic indicators, which proved more effective in representing these nuanced aspects of urban safety.

Ultimately, the insights derived from this research are crucial for stakeholders, policymakers and planners who shall prioritize interventions that enhance visibility, accessibility, and activity in public spaces. By integrating findings that emphasize the importance of well-distributed and contextually relevant urban features, planners can develop strategies that more effectively promote support and enable safety. The robust research methodology outlined offers a robust framework for future research and informs practical, data-driven decisions in urban design and policy-making.

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CHAPTER 5

Policy and Guidelines

5.1 Introduction

The STEP UP project's final task (Task 4.2 - Policy and Design Guidelines), in line with the output of WP2, consisted of the development of policies and guidelines. Essential in shaping cities to be inclusive and responsive to the diverse needs of their inhabitants, the policies and guidelines focus on the inclusion of women's and gender minorities' needs in the design of future transport services. They address the impact of individual characteristics of pedestrians in relation to their gender on the perceived level of safety and walkability, while also advocating for an action-based approach to scientific research.

The project concluded with a list of global policy recommendations focusing on the promotion of inclusive research and planning methodologies that center around gender-based needs, in particular in relation to the theme of urban nighttime safety. A second type of guideline focuses on implementations at a local level, addressing both the location (either the city of Milan as a whole or specific areas within the city) and the methods that proved to be effective through the analysis of data specific to Milan.

5.2 Global Level

Urban policies play a crucial role in creating inclusive cities that cater to diverse needs. By developing methodologies that consider gender and intersectional differences, involving women's voices in data collection, engaging diverse groups in decision-making, and setting explicit targets for gender equality, cities can become more responsive and equitable. Specialized planning for nighttime safety, reframing safety narratives, and revitalizing urban spaces through natural surveillance further enhance urban environments.

Through the lessons learnt from all the stages of the project, starting from the information acquired through the Literature Review, to the conclusions obtained from the Data Collection and Analysis, a list of policy recommendations was developed (Figure 5-1).

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From findings to action

/09

Dalla teoria alla pratica

1/ **Develop** methodologies for urban policies that carefully consider gender and intersectional differences, such as age, economic ability, and ethnic backgrounds, and respond to everyone's needs.

Sviluppare *metodologie per le politiche urbane che abbiano un approccio intersezionale e che tengano in considerazione diversi aspetti, come il genere, l'età e il background culturale, al fine di rispondere alle esigenze di tutti.*

2/ **Include** women+'s voices in mobility data and to employ multimodal data collection methods, consistent with the specific needs of women and gender minorities and their travel behaviors.

Includere *la voce delle donne+ nei dati sulla mobilità e utilizzare metodi di raccolta multimodali, in linea con le caratteristiche specifiche delle donne+ e delle minoranze di genere e dei loro comportamenti di viaggio.*

3/ **Engage** diverse women, gender minorities, and underrepresented groups in planning and decision-making, co-developing the public realm while incorporating qualitative insights often overlooked in quantitative analyses.

Coinvolgere *le donne, le minoranze di genere e i gruppi meno rappresentati nella pianificazione e nel processo decisionale, co-progettando lo spazio pubblico e incorporando le intuizioni qualitative spesso trascurate nelle analisi quantitative.*

4/ **Supplement** measurable outcomes with explicit targets to be routinely evaluated and monitored in the city's strategic plans and visions, considering gender equality as an issue that affects all public policies.

Integrare *il monitoraggio degli obiettivi e dei risultati nei piani strategici della città, nella consapevolezza che l'uguaglianza di genere è un tema che riguarda tutte le politiche pubbliche.*

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Figure 5-1 Policy and Guidelines

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5.2.1 Intersectionality as a necessity

First and foremost, the project STEP UP was able to demonstrate how different individual characteristics shape different levels of perceived safety within the urban environment at night, confirming the meaning and importance of an intersectional approach. Through the development and analysis of the online survey it was in fact possible to show how not only gender determines specific feelings of unsafety. In Figure 5-2 this is shown on both a scale of negatively or positively perceived factors and a scale of neutrality.

Figure 5-2 Intersectional analysis of the influence of urban factors on perceived level of safety

These results are key in understanding how crucial the inclusion of diverse women's voices is in the analysis and planning of public spaces. True inclusion can only be achieved through a process of active engagement of underrepresented groups in the planning and decision-making processes. The STEP UP project was able to show how a complex issue such as perceived safety can be studied through an intersectional methodology. The STEP UP project underpins the necessity for an intersectional approach in both inclusion and engagement processes, specifically in developing

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active engagement methods and tools to ensure the representativeness of all minorities and under-represented groups.

5.2.2 Insights on methodologies

Throughout the project various methodologies were used for the collection of data and existing tools emerged as relevant within the process of active engagement and planning for more equitable and safe public spaces. Regarding the methodologies, each one used proved to be characterized by positive and negative aspects.

Crowd-sourced App Data

The crowd-sourced App data collection was key in the STEP UP project for the geo-localization of data on the city of Milan and the development of the GWR model. This type of method proved to have both positive and negative aspects in the context of defining perceived safety in public space. On the positive side, crowd-sourced data has the potential to generate a vast quantitative database, enabling planners to gather significant amounts of information efficiently. This data can provide valuable insights into various aspects of public spaces, such as usage patterns, preferences, and needs of the community. However, on the negative side, the data collected through crowd-sourcing may be challenging to control in terms of biases, particularly depending on how the App was designed. There is a risk that the data may not be representative of the entire population, as it often reflects the views and experiences of specific segments of society that actively participates in the use of digital tools and in data collection processes. This entails that it is of the utmost importance for the data to be analyzed through a critical lens and a particular attention on obtaining a comprehensive and thorough understanding of the information acquired. Furthermore, the use of geolocalized data,

Online Survey

Online surveys serve as a versatile data collection method that can be developed in various formats to gather information efficiently. One of the key advantages of online surveys is their flexibility in design and implementation, allowing researchers to tailor questions to specific research objectives. However, a critical challenge associated

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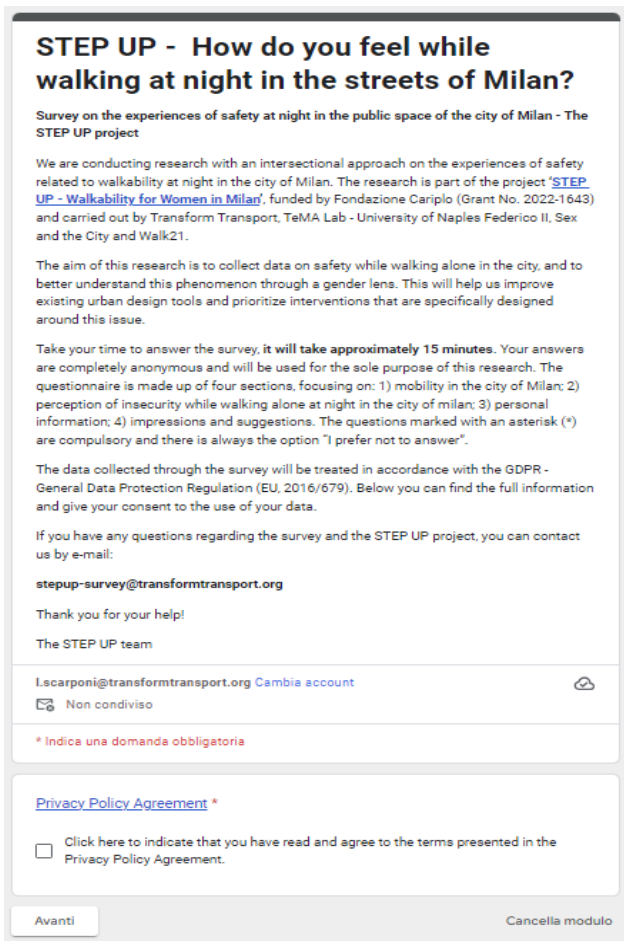
with online surveys is the need to keep them concise, typically under 10-15 minutes, to ensure participant engagement and completion. Another significant obstacle faced with online surveys is the potential limitation in achieving a diverse representation of the population in the pool of participants. Due to the self-selecting nature of online surveys, there is a risk that the sample may not accurately reflect the broader demographic characteristics of the target population, leading to biases in the data collected. To address this limitation, researchers must employ strategies to enhance the inclusivity of online survey recruitment and participation, such as targeted outreach efforts and incentives for underrepresented groups to ensure a more comprehensive and representative dataset.



STEP UP - How do you feel while walking at night in the streets of Milan?

Survey on the experiences of safety at night in the public space of the city of Milan - The STEP UP project

We are conducting research with an intersectional approach on the experiences of safety related to walkability at night in the city of Milan. The research is part of the project '**STEP UP - Walkability for Women in Milan**', funded by Fondazione Cariplo (Grant No. 2022-1643) and carried out by Transform Transport, TeMA Lab - University of Naples Federico II, Sex and the City and Walk21.

The aim of this research is to collect data on safety while walking alone in the city, and to better understand this phenomenon through a gender lens. This will help us improve existing urban design tools and prioritize interventions that are specifically designed around this issue.

Take your time to answer the survey, **it will take approximately 15 minutes**. Your answers are completely anonymous and will be used for the sole purpose of this research. The questionnaire is made up of four sections, focusing on: 1) mobility in the city of Milan; 2) perception of insecurity while walking alone at night in the city of milan; 3) personal information; 4) impressions and suggestions. The questions marked with an asterisk (*) are compulsory and there is always the option "I prefer not to answer".

The data collected through the survey will be treated in accordance with the GDPR - General Data Protection Regulation (EU, 2016/679). Below you can find the full information and give your consent to the use of your data.

If you have any questions regarding the survey and the STEP UP project, you can contact us by e-mail:

stepup-survey@transformtransport.org

Thank you for your help!

The STEP UP team

l.scarponi@transformtransport.org Cambia account

Non condiviso

* Indica una domanda obbligatoria

Privacy Policy Agreement *

Click here to indicate that you have read and agree to the terms presented in the Privacy Policy Agreement.

Avanti Cancella modulo

Figure 5-3 The STEP UP survey questionnaire

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Focus Groups

Focus groups as a data collection method offer the advantage of providing researchers with almost total control over the pool of participants, ensuring a representative sample that aligns with the research objectives. This level of control allows for the selection of participants based on specific criteria, such as demographics, experiences, or expertise, enhancing the depth and richness of the data collected. However, a notable downside of focus groups is the relatively small quantity of data generated compared to other methods like surveys or quantitative analyses. The intimate nature of focus group discussions, while beneficial for in-depth exploration of topics, limits the scalability of data collection. This constraint can pose challenges in generalizing findings to larger populations or drawing statistically significant conclusions. Therefore, while focus groups excel in providing detailed insights and facilitating interactive discussions, researchers must consider the trade-off between depth of information and sample size when utilizing this method in data collection and analysis.

5.2.3 Existing tools

Currently there are many existing tools that as citizens can be used to both contribute to the collection of data and to achieve a higher level of perceived safety while passing through public spaces. Some are specifically oriented towards the needs of women and gender minorities (similarly to the Wher App), others have been created for the general public.

My Safetipin: Safety Companion App

The My Safetipin app[27] serves as a trusted safety companion for individuals exploring new cities or navigating familiar neighborhoods. This Appoffers various features to enhance safety and security during journeys, including finding safer routes, assessing the safety levels of public places through quick audits, and enabling location tracking for added security. One of the key features of the Appis the ability to check the safety score of an area based on safety ratings, providing users with valuable information

[27] See: https://play.google.com/store/apps/details?id=com.safetipin.mysafetipin&hl=en_IN&pli=1

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before venturing out. Additionally, users can contribute to the Appby rating safety parameters in their neighborhoods, fostering a sense of community engagement and empowerment. While the Appexcels in providing personalized safety support and information, a potential limitation lies in the relatively small quantity of data generated due to its focus on qualitative insights and user experiences. Despite this limitation, the My Safetipin Appoffers a comprehensive set of tools to enhance personal safety and empower users to make informed decisions while navigating urban environments.

Viola App

The VIOLA app[28] is designed to provide tranquility and security to individuals while they are out and about. This Appconnects users with a network of volunteers available 24/7 for video calls, accompaniment, and to offer a sense of security whenever needed. Key features of the Appinclude round-the-clock video call assistance with qualified volunteers to ensure safety during walks, easy selection of preferred language for service utilization, and a user-friendly interface with a simple and intuitive design for seamless navigation. The Appprioritizes user privacy and security, ensuring safe and secure calls for peace of mind. By joining VIOLA, users become part of a community dedicated to making walks safer for everyone. Whether returning home late at night, heading to an appointment, traveling in a taxi, or feeling insecure in any situation, VIOLA is there to support users. By downloading the app, individuals can take the first step towards a safer journey, highlighting the app's commitment to enhancing personal safety and fostering a supportive community environment.

112 Where ARE U App

The "Where Are U" Appis a valuable tool developed for calling the European Emergency Number 112, automatically sending location information and additional user-provided details to the emergency services. This Appleverages the European

[28] See: https://play.google.com/store/search?q=viola%20app&c=apps&hl=en_IN

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Emergency Number 112 to ensure a unified response for emergencies, enabling swift assistance from Ambulance, Firefighters, and Police through a single Public Safety Answering Point (PSAP). Key features of the Appinclude the ability to send precise location information to the 112 PSAP management software for rapid emergency response, store personal data including In Case of Emergency (ICE) contacts for the PSAP operator's reference, and provide an enhanced interface for visually impaired users. Additionally, the Appoffers a "silent call" function for situations where speaking is not possible, allows users to select the appropriate type of emergency when contacting 112, and seamlessly switches to the relevant emergency number when traveling abroad. The Appalso includes a guide and tutorial for user assistance and facilitates communication via chat with the 112 PSAP, catering to users with hearing impairments. To access the services of "Where Are U," users are required to undergo a free registration process, ensuring a streamlined and secure user experience in times of emergency.

5.3 Local Level

The results at a local level, specifically linked to the city of Milan, were informed by the GIS analysis and mapping of Chapter 4, and by the survey and focus groups analysis of Chapter 3. Within the course of the project STEP UP, the differentiated analysis of Milan resulted in recurring areas of the city with a particularly positive or negative connotation regarding the perceived level of safety. As a whole, the city of Milan offers a diversified landscape of perceived safety in urban space, some areas characterized by a certain type of perception vary within a few meters of each other, to the point of being in some cases confined to single streets.

5.3.1 STEP UP Interactive WebGIS

The STEP UP Interactive WebGIS[29] is a data exploration tool (see Figure 4-9) that was built in collaboration with Modality[30]. This platform aims to respond to a different

[29] See: https://stepup-viz.transformtransport.org/
[30] See: https://with-modality.com/en/

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goal than the Safety Index Map. While the former is meant as an agnostic exploration tool, the latter aims to go over the main data-driven processes of the whole process in a cohesive way. In particular, the Web Appstarts by showcasing a selection of 100 places across Milan, showing the location, the Wher App Data score and a street-view picture. The selection of these places is based on a critical methodology mixing quantitative and qualitative approaches, with the goal of representing at least one location per NIL and locations that may feel familiar or known from the perspective of a city user. Also, the selection is meant to represent a wide range of situations, with an heterogeneous Wher App data score and diverse indicators' values.

The second map draws a qualitative comparison between the indicators and the same locations, plotting the parallel variation of each variable on each place. This allows a quick and effective exploration of these datasets, shedding light on the complexity that these analyses inherently bring to the table. Finally, the third map includes the GWR model outputs, linking these to the "improvable streets" approach and to the places, enabling a critical and informed comprehension of the model results.

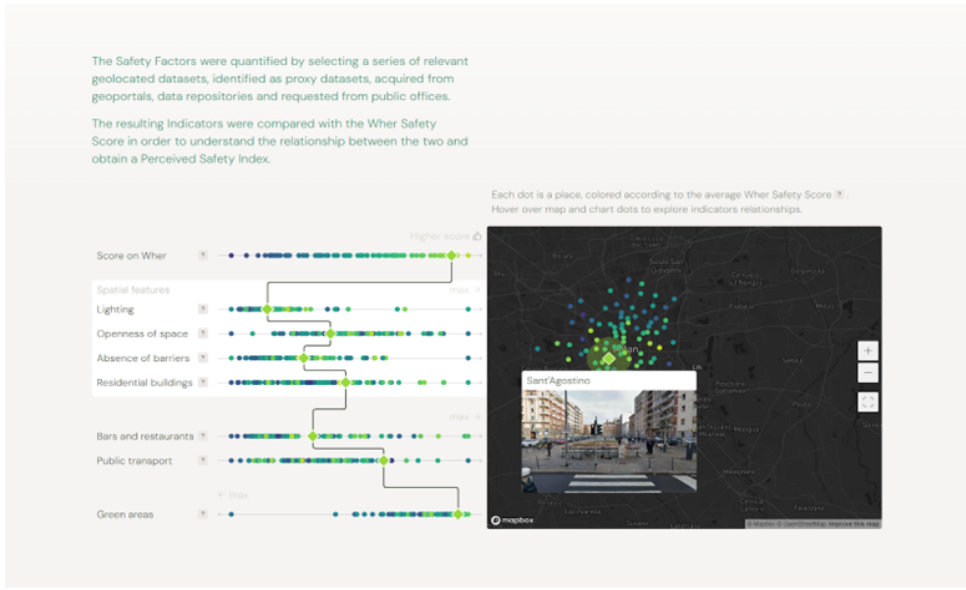

Figure 5-4 Screenshot of the STEP UP Interactive WebGIS

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5.3.2 Good Examples in Milan

Some areas emerged as having a positive perception of nighttime safety amongst women and gender minorities. These areas include CAP 20154 (Sarpi), CAP 20133 (Città Studi e Zona delle Regioni) and CAP 20135 (Porta Romana), which are generally characterized by a high level of activity, of different typologies. As already stated, the area of Sarpi is perceived as positive due to the pedestrian area and the high amount of commercial activities which implicate the diversified presence of people on the street. On the other hand, Città Studi is the area around which many universities of the cities develop, which also entails quite a high activity both during the day and during the evening and nighttime.

5.3.3 Areas for Future Research

Some areas have emerged as more problematic, resulting as unsafe in most of the outcomes of the various datasets. Areas such as CAP 20124 (Stazione Centrale) and CAP 20127 (via Padova) are characterized by a more complex nature. This complexity is attributed to their proximity to the station and the recurring observations regarding the presence of specific demographic groups, particularly men, racialized individuals, and those under the influence of alcohol or drugs.

These areas should be prioritized for further study, not only due to the assessed perception of safety through various methodologies but also because the influential factors are related to patterns of city use. These factors are challenging to map and analyze through conventional data, necessitating a more in-depth, qualitative research approach to understand the dynamics of perceived safety in urban environments.

5.4 Final Remarks and Way Forward

Within the context of equitable and sustainable urban planning, the STEP UP project has provided important insight on the subject of walkability through a gendered perspective. By emphasizing the gendered perspective and intersectional approach in understanding walkability, the project addresses the critical need to consider diverse social dimensions in urban development initiatives and the need for holistic

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approaches for more comprehensive and sustainable development. Furthermore, the emphasis on data-driven methodologies within the STEP UP project underscores the importance of evidence-based decision-making in urban planning, through the development of a replicable methodology based on the case study of Milan, as an initial benchmark for future research. By providing valuable insights and methodological frameworks, this project paves the way for more inclusive and evidence-based approaches to equitable urban development.

The first stage of the project and overall literature review encompassed a comprehensive analysis of scientific literature, global reports, and urban design guidelines addressing gender inequality in cities. By adopting an intersectional framework, the review aimed to understand the complex dynamics of social discrimination, particularly regarding women's and gender minorities' perception of safety in public spaces. The literature review highlighted gaps in addressing intersectionality in discussions on gender inequality and safety, often focusing qualitatively on limited axes of discrimination, data collection methods predominantly utilized qualitative tools like focus group discussions and surveys. The scientific literature review emphasized safety factors related to gender perceptions in public spaces, categorizing them into aspects of the built environment, urban use, and specific land use typologies. The report review underscored the significance of urban walkability for women globally, emphasizing the importance of walking in women's mobility experiences, especially in deprived areas. The selected guideline documents varied in scale and focus, targeting urban actors with diverse process- and design-oriented guidelines. Case studies provided existing and concrete approaches to inclusive spatial design and non-physical interventions to address gender-related inequalities in public spaces. The synthesis of significant reports, case studies, and scientific literature offered a multifaceted perspective, identifying gaps for further research within the STEP UP project. This initial stage of the project laid a solid foundation for the investigations addressed in the following stages and in the development of policies and guidelines.

The stage of data collection combined conventional and digital methods, following a digital humanities approach. The collected results form a framework of information

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for a detailed spatial analysis of safety perceptions of women and gender minorities in Milan. The study focuses on developing a GIS statistical model to map women's safety perceptions and understand the factors influencing these perceptions in urban environments. By integrating qualitative and quantitative insights from various data sources, including location-based data, georeferenced votes from the Wher App, survey results, and focus group discussions, the research identifies safety factors and their impact on safety perceptions. The mixed data collection methodology allows for a comprehensive analysis, comparison, and validation of safety factors, providing insights into additional factors influencing safety perceptions. This approach not only enhances the understanding of safety perceptions but also informs policy guidelines and recommendations for gender-sensitive urban planning in Milan.

The implementation of the Geographically Weighted Regression (GWR) model tackles the complexity of perceived safety by conceptualizing it in a series of quantitative indicators. While this process is limited and biased by definition, it is a crucial step to evaluate at large scale and high resolution urban phenomena, and to elaborate strategies to represent complex data by abstracting their content.

In particular, the results of the model show how most of the city can be represented in almost its totality and how a critical interpretation of the outcomes can shed light on unknown aspects, such as the areas requiring additional detail and data.

Within the field of urban planning and city development, the issue of perceived level of safety can often seem beyond the scope of action of urban planners and designers, however research indicated that there is a significant amount of improvement that can be made through specific planning and design interventions, the STEP UP project is an example of this.

Urban planners and practitioners have the unique opportunity to not only address safety concerns within cities, but also to do so whilst rethinking urban space as an inclusive and equitable environment, by adopting an intersectional approach and level the 'walking' field between genders, capitalizing on an exponentially growing body of planning tools and of available data.

The way forwards starts with the critical reevaluation of the cognitive approaches of city planners and designers and by extension the methods through which urban

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environments are studied, planned and designed. With the aim of ensuring that the multitude of people who navigate these spaces can do so without fear, regardless of their gender.

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ANNEXES

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Annex I - Short description of the Safety Factors

SAFETY FACTORS Level 1	SAFETY FACTORS Level 2	Definition
SF_L1 Spatial Features	L2 Lighting	Presence, maintenance and features of lighting systems
	L2 Openness	Ability to see and move in all directions
	L2 Visibility “eyes on the street”	Possibility to be seen from shops, vendors and buildings
	L2 Obstructions to visibility	Presence of greenery and other elements as an obstacle and supplying hiding places
	L2 Architectural Barriers	Physical impediments to free/ direct movements
	L2 Security Devices	Presence of emergency buttons and/ or surveillance systems
SF_L1 City Use	L2 Crime rate	Reported crimes on streets related to assault, harassment, robbery
	L2 Homeless or encampments	Presence of homeless groups and encampments
	L2 Sex work/ sex workers	Presence of sex workers or the activity of sex work
	L2 Urban degradation	Carelessness of streets, sidewalks and public spaces (filth, tags, etc.)
	L2 Presence of people	Sense of belonging, perception of anonymity and isolation
SF_L1 Hotspots	L2 Transport hubs (bus stop/tram stop)	Transport infrastructures of small dimensions
	L2 Railway stations	Presence of train stations
	L2 Businesses	Presence and opening of commercial activities
	L2 Public spaces	Squares and tactical urbanism interventions
	L2 Spaces of gathering	Cultural, social, recreational, aggregation, educational centers
	L2 Parks	Large urban green areas and parks
	L2 Open spaces	Large parking, dismissed/ abandoned areas
	L2 Law enforcement units	Police stations/ patrols

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Annex II - Literature review about SF_L1 And SF_L2

City use	Spatial Features						
Crime rate	*Security devices*	*Architectural barriers*	*Obstructions to visibility*	*Visibility*	*Openness*	*Lighting*	*Author(s), Year*
•	•	•	•	•	•	•	Ceccato et al., 2022
•		•				•	England & Simon, 2010
			•		•		Fenster, 2005
•							Galbrun et al., 2014
•			•				Golan et al., 2019
•						•	Gorrini et al., 2021
•							Grove, 2015
•				•		•	Koskela, 1999
•							Lebugle et al., 2017
							Levy, 2013
•	•	•	•	•	•	•	Loukaitou-Sideris, 2006
	•				•	•	Loukaitou-Sideris, 2014
•	•					•	Pain, 2000
•							Pain, 2001
							Ramirez et al., 2021
		•	•		•	•	Rossetti et al., 2019
						•	Uteng, 2019
	•			•		•	Uteng, 2021
•							Vasquez-Henriquez, 2020
	•					•	Vitrano et al., 2018
•							Whitzman et al., 2014
	•	•				•	Whitzman, 2012

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Hotspots								
Public space	*Businesses*	*Railway station*	*Transport hub*	*Presence of people*	*Urban degradation*	*Sex work/ prostitution*	*Homeless or encampments*	*Author(s), Year*
		•	•	•	•			Ceccato et al., 2022
•				•				England & Simon, 2010
								Fenster, 2005
								Galbrun et al., 2014
	•				•	•	•	Golan et al., 2019
	•		•					Gorrini et al., 2021
				•				Grove, 2015
•	•	•	•	•	•	•		Koskela, 1999
•				•				Lebugle et al., 2017
•								Levy, 2013
•	•	•	•	•	•		•	Loukaitou-Sideris, 2006
•	•	•	•	•	•			Loukaitou-Sideris, 2014
•					•	•	•	Pain, 2000
•								Pain, 2001
•				•				Ramirez et al., 2021
	•			•	•			Rossetti et al., 2019
				•				Uteng, 2019
•	•	•	•	•	•			Uteng, 2021
		•	•					Vasquez-Henriquez, 2020
•	•		•	•				Vitrano et al., 2018
		•						Whitzman et al., 2014
		•	•					Whitzman, 2012

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Law enforcement units	*Open spaces*	*Parks*	*Spaces of gathering*	*Author(s), Year*
				Ceccato et al., 2022
				England & Simon, 2010
		•		Fenster, 2005
				Galbrun et al., 2014
	•	•		Golan et al., 2019
•	•	•		Gorrini et al., 2021
•				Grove, 2015
	•	•		Koskela, 1999
				Lebugle et al., 2017
				Levy, 2013
•	•	•	•	Loukaitou-Sideris, 2006
•	•			Loukaitou-Sideris, 2014
	•	•		Pain, 2000
				Pain, 2001
				Ramirez et al., 2021
		•		Rossetti et al., 2019
•				Uteng, 2019
				Uteng, 2021
				Vasquez-Henriquez, 2020
•				Vitrano et al., 2018
	•			Whitzman et al., 2014
	•			Whitzman, 2012

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Annex III - Literature review about gender, timeframe and tools

References	Gender				Timeframe			Tools	
Author (s), Year	*General*	*Gender-focused*	*Intersectional*	*Undefined*	*Daytime*	*Night*	*GIS*	*GPS/ App Data*	*Surveys/ Focus Groups*
Beebeejaun, 2017			●	●				●	
Ceccato et al., 2022		●			●	●	●	●	●
England & Simon, 2010			●	●					
Fenster, 2005			●	●					
Galbrun et al., 2014	●			●			●		
Golan et al., 2019		●			●		●		●
Gorrini et al., 2021		●		●			●		
Grove, 2015			●	●			●	●	●
Koskela, 1999			●		●	●			●
Lebugle et al., 2017		●	●	●					●
Levy, 2013		●		●					●
Loukaitou-Sideris, 2006		●	●	●					●
Loukaitou-Sideris, 2014		●	●	●					●
Pain, 2000			●						

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References	Gender				Timeframe			Tools	
Author (s), Year	*General*	*Gender-focused*	*Intersectional*	*Undefined*	*Daytime*	*Night*	*GIS*	*GPS/ App Data*	*Surveys/ Focus Groups*
Pain, 2001			●	●					●
Ramirez et al., 2021					●				●
Rossetti et al., 2019	●			●				●	●
Uteng, 2019		●	●	●		●			
Uteng, 2021		●		●					
Vasquez-Henriquez, 2020		●		●				●	●
Vitrano et al., 2018		●				●			●
Whitzman et al., 2014			●	●					●
Whitzman, 2012		●		●					●

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Annex IV - Policy benchmarking and reports

References		Geographic scale and location		Transport mode studied				
Author(s), Year	*Background studies*	*Original studies (if applicable)*	*Study areas*	*Walking*	*Cycling*	*Public transport*	*Private vehicles*	*Other*
Allen and Vanderschuren, 2016	Global (focus on developing countries)	Local (city-level)	Cape Town (South Africa)	●	●	●		●
Allen, 2018	Global (focus on developing countries)		Developing countries	●	●	●	●	
Allen et al., 2018	Global	Local (city-level)	Quito (Ecuador), Buenos Aires (Argentina), Santiago (Chile)	●	●	●	●	●
Andreola and Muzzonigro, 2021	Local (city-level)		Milan (Italy)	●	●	●	●	●
Arup, 2022	Global	Local (district-level)	Legacy Corporation area in London (UK)	●				
Barker et al., 2022	Local (national)	Local (county-level)	Five districts of West Yorkshire (UK)	●				
Cahill et al., 2020	Global	Local (national for surveys, city-wide for interviews)	Cork, Dublin (Ireland)	●	●	●	●	●
Cardinacci and Power, 2022	Global	Global		●				

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References		Geographic scale and location		Transport mode studied				
Author(s), Year	*Background studies*	*Original studies (if applicable)*	*Study areas*	*Walking*	*Cycling*	*Public transport*	*Private vehicles*	*Other*
Dellenbaugh-Losee and Dreyer, 2022	Regional		Europe	●				
Fahmy et al., 2014	Local (national)	Local (city-level)	Cairo (Egypt)	●	●	●		
FIA Foundation and Safetipin, 2020	Local (national)	Local (district-level)	Three districts in Delhi (India)	●		●		
Goulds and Tanner, 2018		Local (city-level)	Lima (Peru), Madrid (Spain), Kampala (Uganda), Delhi (India), Sydney (Australia)	●		●		
Lambrick et al., 2010		Local (city-level)	Rosario (Argentina), Delhi (India), Petrozavodsk (Russia), Dar es Salaam (Tanzania)	●				
Loukaitou-Sideris et al., 2009	Global	Local (national-level)	United States	●	●	●	●	●
Ramboll Smart Mobility, 2021	Global	Local (city-level)	Helsinki (Finland), Oslo (Norway), Stockholm (Sweden), Copenhagen (Denmark), Berlin (Germany), Delhi (India), Singapore (Singapore)	●	●	●	●	●
Safetipin, 2022	Local (city-level)	Local (district-level)	Eight districts in Buenos Aires (Argentina)	●				

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References		Geographic scale and location		Transport mode studied				
Author(s), Year	*Background studies*	*Original studies (if applicable)*	*Study areas*	*Walking*	*Cycling*	*Public transport*	*Private vehicles*	*Other*
Shah et al., 2017	Global			●	●	●	●	●
Travers et al., 2013	Global	Local (city-level)	Cairo (Egypt), Delhi (India), Hanoi (Vietnam), Kampala (Uganda), Lima (Peru)	●		●		
UK Government, 2019	Local (national)	Local (national-level)	UK	●		●		
Walker, 2022	Regional		Europe	●	●	●	●	●

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Annex V - Review of data collection methods in reports

References	Data collection method								
Author(s), Year	*Literature review/ Desk research*	*Review of existing data (data analysis)*	*Surveys and Questionnaires*	*Focus group Discussions (FGDs)*	*Interviews including In-depth Interviews (IDIs)*	*Workshops*	*Safety Audit/ Safety walks*	*App/ online safety mapping tools*	*Specific tool*
Allen and Vanderschuren, 2016	●	●	●	●	●				
Allen, 2018	●								
Allen et al., 2018		●	●	●	●	●			
Andreola and Muzzonigro, 2021	●		●		●				
Arup, 2022			●	●				●	Online tool
Barker et al., 2022				●					
Cahill et al., 2020				●	●				
Cardinacci and Power, 2022	●		●		●	●			
Dellenbaugh-Losee and Dreyer, 2022	●								
Fahmy et al., 2014			●	●	●			●	HarassMap
Fia Foundation and Safetipin, 2020				●	●		●	●	Safetipin
Goulds and Tanner, 2018								●	Free To Be
Lambrick et al., 2010	●		●	●			●		
Loukaitou-Sideris et al., 2009	●		●		●				

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References	Data collection method								
Author(s), Year	*Literature review/ Desk research*	*Review of existing data (data analysis)*	*Surveys and Questionnaires*	*Focus group Discussions (FGDs)*	*Interviews including In-depth Interviews (IDIs)*	*Workshops*	*Safety Audit/ Safety walks*	*App/ online safety mapping tools*	*Specific tool*
Ramboll Smart Mobility, 2021		●	●	●	●				
Safetipin, 2022			●				●	●	Safetipin
Shah et al., 2017				●					
Travers et al., 2013	●			●	●				
UK Government, 2019			●	●					
Walker, 2022	●	●							

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Annex VI - Policy benchmarking and guidelines

References	Scope		Geographic scale and location			Target audience		
Author(s), Year	*" GP" : General Planning Guide " SPC" : Safety in Public Space Guide*		*Scale of area of interest*	*Area of interest*	*Scale of target area*	*Public authorities*	*Private entities*	*Third-sector organizations*
Action Aid, 2013		SPC	Regional	Global South (Nepal, Cambodia, Liberia, Ethiopia, Brazil)	Local (National)			●
Andersdotter Fabre et al., 2021		GP	Global		Local	●	●	●
Cities Alliance, 2022		GP	Regional	Global South	Local	●	●	●
Drăguțescu et al., 2020		GP	Regional	Europe	Regional	●	●	
Generalitat Valenciana, 2022		GP	Local	Valencia (Spain)	Local	●	●	●
Safer Parks Consortium, 2023		SPC	Local	United Kingdom	Local	●	●	●
Simon and Stoppi, 2021		SPC	Local	United Kingdom	Local	●	●	
Taft et al., 2020		SPC	Local	Melbourne (Australia)	Local	●	●	●
Tandon Mehrotra et al., 2022		GP	Regional	Global South (Asia, Africa, Latin America)	Local	●	●	●
Terraza et al., 2020		GP	Global		Local	●	●	●

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Annex VII - Structure of the online survey (English version)

Section 1

STEP UP - How do you feel while walking at night in the streets of Milan?

Survey on the experiences of safety at night in the public space of the city of Milan - The STEP UP project

We are conducting research with an intersectional approach on the experiences of safety related to walkability at night in the city of Milan. The research is part of the project **'STEP UP - Walkability for Women in Milan'**, funded by Fondazione Cariplo (Grant No. 2022-1643) and carried out by Transform Transport, TeMA Lab - University of Naples Federico II, Sex and the City and Walk21.

The aim of this research is to collect data on safety while walking alone in the city, and to better understand this phenomenon through a gender lens. This will help us improve existing urban design tools and prioritize interventions that are specifically designed around this issue.

Take your time to answer the survey, **it will take approximately 15 minutes**. Your answers are completely anonymous and will be used for the sole purpose of this research. The questionnaire is made up of four sections, focusing on: 1) mobility in the city of Milan; 2) perception of insecurity while walking alone at night in the city of milan; 3) personal information; 4) impressions and suggestions. The questions marked with an asterisk (*) are compulsory and there is always the option "I prefer not to answer".

The data collected through the survey will be treated in accordance with the GDPR - General Data Protection Regulation (EU, 2016/679). Below you can find the full information and give your consent to the use of your data.

If you have any questions regarding the survey and the STEP UP project, you can contact us by email: stepup-survey@transformtransport.org

Thank you for your help!

The STEP UP team

Privacy Policy Agreement

PDF Privacy Policy Agreement

Click here to indicate that you have read and agree to the terms presented in the Privacy Policy Agreement.

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Section 2

Mobility in the city of Milan

In this section you will find some questions related to your traveling patterns in Milan.

1. **You are resident in**
   - The Municipality of Milan
   - The province/district of Milan
   - other

2. **What is the postcode of where you live?**

open answer

3. **If you don't live in Milan**

In a typical week you travel to Milan
   - every day of the week
   - every workday of the week
   - at least three days in a week
   - once or twice a week
   - less than once a week
   - it depends, my weeks are very variable

4. **On a typical day in Milan, how do you usually get around?** Max three answers
   - on foot
   - by railway link
   - by bus or trolleybus
   - by car (private or car sharing)
   - by bicycle / electric kick scooter
   - by metro
   - by scooter / motorbike
   - by taxi
   - by train
   - by tram
   - other

5. **On an average day, how long do you walk in Milan?**
   - more than one hour
   - about one hour
   - about 30 minutes
   - about 15 minutes

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- less than 15 minutes

6. On a typical day, at what times of day do you usually walk around the city? Max three answers

- early morning (h 5 - 8 am)
- late morning (h 8 - 12 am)
- afternoon (h 12 am - 7 pm)
- evening (h 7 - 11 pm)
- night (h 11 pm - 5 am)

7. When you are walking alone in Milan by day

- I always feel safe
- most of the time I feel safe
- sometimes I feel unsafe/ uneasy
- I often feel unsafe/ uneasy
- most of the time I feel unsafe/ afraid

8. When you are walking alone in Milan at night

- I always feel safe
- most of the time I feel safe
- sometimes I feel unsafe/ uneasy
- I often feel unsafe/ uneasy
- most of the time I feel unsafe/ afraid
- I don't go out walking at night

9. You feel particularly uneasy/ unsafe when moving in Milan. Max three answers

- on foot
- by railway link
- by bus or trolleybus
- by car (private or car sharing)
- by bicycle/ electric kick scooter
- by metro
- by scooter/ motorbike
- by taxi
- by tram
- by train
- I don’t feel uneasy/ unsafe
- other

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10. Do you go out alone in the evening and/or at night in Milan (from around 8 pm to 6 am)?

- yes, often
- yes, sometimes
- rarely
- no, I never go out alone
- no, I never go out even accompanied

11. If you answered no. Is fear one of the reasons why you do not go out in the evening and/or at night?

- yes, it is the main reason
- yes, this aspect has an impact among others
- no, I do not go out for other reasons
- other

12. If you live in Milan, do you feel safe in your neighborhood when you're walking?

- yes, I feel very safe
- yes, I generally feel safe
- sometimes yes, sometimes not so much
- I don't feel very safe
- no, I don't feel safe at all

Section 3

Perception of safety while walking alone at night in the city of Milan

In this section we ask you to indicate the relevance of some urban indicators on your perception of safety in Milan.

1 = it makes me feel very unsafe; 3 = neutral; 5 = it makes me feel very safe

13. How does the presence of an efficient lighting system affect your perception of safety at night?

It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

14. How does the presence of visual obstructions (trees, bushes, cars, etc.) affect your perception of safety at night?

It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

15. How does the possibility to see and acknowledge what is around you (wide field of vision) affect your perception of safety at night?

It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

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16. How does the possibility of being seen by other people affect your perception of safety at night (from windows, shop fronts, the street, etc.)?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

17. How does the presence of escape routes affect your perception of safety at night (the condition of having more than one street option in case I need to escape)?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

18. How does the presence of surveillance systems (cameras, CCTV) affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

19. How does the presence of emergency call devices affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

20. How does the presence of police stations/patrols affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

21. How does the presence of recognizable charging points for smartphones affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

22. How does the negative reputation of the location (area with a high crime rate such as assaults, harassment, robberies) affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

23. How do personal incidents of aggression/ harassment experienced by you or others affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

24. How does the diverse presence of people of different ages, genders, backgrounds, etc. affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

25. How does the presence of only men affect your perception of safety at night?

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It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

26. How does the presence of drug dealing activity affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

27. How does the presence of people who are drunk/ under the effect of drugs affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

28. How does the presence of homeless people affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

29. How does the presence of racialized* people affect your perception of safety at night?
Racialisation is the process by which a dominant group attributes racial and inferiorizing characteristics to a dominated group.
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

30. How does the presence of sex workers/ prostitution affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

31. How does the presence of open commercial activities affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

32. How does the neglect of streets, pavements and public spaces (dirt, deterioration, etc.) affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

33. How does being near or inside a railway station affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

34. How does being at a tram/ bus/ metro stop affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

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35. How does being in an equipped square (with benches, games, tables, public art, etc.) affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

36. How does the presence of recognisable and open centers of cultural, social and recreational gathering affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

37. How does being in an urban park or a large green area affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

38. How does being in a disused urban area affect your perception of safety at night (e.g., a former industrial area with disused warehouses, an unguarded building site, etc.)?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

39. How does being in a large open-air car park affect your perception of safety at night?
It makes me feel very unsafe 1-2-3-4-5 It makes me feel very safe

40. Which of these factors or places also cause you to feel unsafe during the day? Multiple answer

- underground or enclosed unlit spaces
- presence of visual obstructions (trees, bushes, cars, etc.)
- the impossibility to see and acknowledge what is around you
- the impossibility of being seen by other people
- the absence of escape routes
- the presence of surveillance systems (cameras, CCTV)
- the absence of surveillance systems (cameras, CCTV)
- the presence of police stations/ patrols
- the absence of police stations/ patrols
- the negative reputation of the location (area with a high crime rate such as assaults, harassment, robberies)
- personal incidents of aggression/ harassment experienced by you or others
- presence of only men
- presence of drug dealing activity
- presence of people who are drunk/ under the effect of drugs
- presence of homeless people
- presence of racialized* people

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- presence of sex workers / prostitution
- the neglect of streets, pavements and public spaces (dirt, decay, etc.)
- railway stations
- tram/bus/metro stops
- urban parks and large green areas
- disused urban areas (e.g. a former industrial area with disusedwarehouses, an unguarded building site, etc.)
- large open-air car parks
- other

41. **Of all the routes you walk in Milan, what is the place (street, square, station, etc.) where you feel at ease/ safe at night?** Please specify the name of the place
Open answer

42. **In your own words, could you explain what features of this place contribute to making you feel at ease/ safe?**
Open answer

43. **Of all the routes you walk in Milan, what is the place (street, square, station, etc.) where you feel most uneasy/ insecure at night?** Please specify the name of the place
Open answer

44. **In your own words, could you explain what features of this place contribute to making you feel uneasy/ insecure?**
Open answer

45. **What tactics do you use to feel safer/ less vulnerable when walking alone at night?**
Open answer

46. **Have you experienced sexual harassment in the city of Milan (in public space, in a public setting or on public transport)?**
Sexual harassment is defined as any unwanted behaviour with sexual connotations or any other type of discrimination based on sex that offends the dignity of individuals, including physical, verbal or non-verbal attitudes. The following are examples of sexual harassment: a) implicit or explicit requests for offensive or unwelcome sexual performance; b) adoption of sexist criteria in any kind of interpersonal relationship; c) threats or retaliation following the refusal of sexual performance; d) unwanted and inappropriate physical contact; e) verbal appreciation of the body or comments on sexuality or sexual orientation that are deemed offensive.

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- no, never
- rarely
- yes, sometimes
- yes, often
- prefer not to answer

47. Have you experienced sexual violence in the city of Milan (in public space, in a public setting or on public transport)?

Sexual violence is defined as any unwanted conduct of a sexual nature which, by violence or threat or by abuse of authority, compels someone to perform or submit to sexual acts.

- no, never
- yes, more than five years ago
- yes, once in the last five years
- yes, more than once in the last five years
- prefer not to answer

Section 4

Demographics

This section contains a number of sensitive questions. We would like to remind participants that the answers are anonymous and that on the most sensitive questions there is always the possibility of not declaring one's status. The intention of this section is to address the survey in the most inclusive way possible, we believe that only an intersectional approach can provide representative research on this topic.

48. Age

- up to 17
- 18-25
- 26-35
- 36-45
- 46-59
- 60-74
- over 74

49. How do you currently describe your gender?

- man
- non-binary
- woman
- prefer not to answer
- other - specify if you want

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50. What sex were you assigned at birth?

- female
- intersex
- male
- prefer not to answer

51. Do you identify as transgender?

- yes
- no
- prefer not to answer

52. If you answered yes, are you perceived as such?

- yes
- no
- it depends
- prefer not to answer

53. What is your sexual orientation and/or sexual identity?

- asexual
- bisexual
- heterosexual
- homosexual
- prefer not to answer
- other _____

54. Physical ethnicity

Considering the physical attributes usually referred to ethnicity, which of the following general definitions best describes you. You can choose more than one option

- Asian
- Black or African American
- Hispanic or Latino
- Indigenous, Aboriginal or First Nations
- Middle Eastern
- White
- Other, specify: _____
- prefer not to answer

55. Cultural ethnicity

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Ethnicity reflects the cultural traditions, values and practices shared by people across generations. With this in mind, which definitions best describe you? (you can choose more than one option)

- Arab, Middle Eastern or North African
- Asian or Asian American
- Black or African American
- Hispanic or Latino
- Indigenous, Aboriginal or First Nations
- White or European American
- Other, specify: _____
- prefer not to answer

56. Do you feel discriminated against because of your ethnicity?

- yes, often
- yes, in certain contexts
- rarely
- no
- prefer not to answer

57. With which religious community do you currently identify?

- none (atheist, agnostic)
- buddhist
- christian
- jewish
- hindu
- islamic
- Other, please specify: _____
- prefer not to answer

58. Citizenship

If you have more than one, please indicate the prevailing one
Drop-down list with all citizenships

59. Do you currently have a disability?

- yes
- no
- prefer not to answer

60. If you do have a disability, how would you describe it?

- sensorial disabilities

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- mobility disabilities
- intellectual disabilities
- psychic disabilities
- prefer not to answer
- other _____

61. If you do have a disability, is it perceivable/ recognizable by others?

- yes
- no
- depends
- prefer not to answer

62. What is the most advanced educational qualification you have obtained?

- no qualification
- primary school certificate
- middle school certificate
- high school diploma
- bachelor's degree
- master's degree
- master's degree/postgraduate degree
- PhD
- prefer not to answer

63. What is your employment status?

You can give more than one answer if your condition implies more than one option (if you work part-time, study in the evening hours, etc.).

- permanent employee
- fixed-term employees, project work, etc.
- self-employed (VAT number, freelancer, etc.)
- full-time employment
- part-time work
- involuntary part-time work
- undeclared work
- unpaid work (apprenticeship, internship, volunteer work, etc.)
- homemaker
- student
- retired

- unemployed
- other, please specify: _____

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- prefer not to answer

64. How would you define your economic condition in relation to your purchasing power and the life cost where you live?
Purchasing power is given by one's own income or the family's resources.

- I struggle to meet basic needs
- I respond to basic needs (food, housing, essential clothing, healthcare expenses)
- I also meet secondary needs (study materials, non-essential clothing, electronic devices, social life, etc.)
- I can also access extra expenses (fine restaurants, designer objects, expensive clothing, valuable electronic devices, etc.)
- I prefer not to answer

65. Do you live in a house/apartment owned by you/your family?

- yes, and I don't contribute financially to its upkeep (e.g. I don't pay the bills / I don't pay the condo fees)
- yes, and I contribute financially to its maintenance (e.g. I pay the bills / I pay the condo fees)
- yes, and I contribute financially to its maintenance and am paying the mortgage
- no, I am renting at my family's expense
- no, I am renting at my own expense
- prefer not to answer
- other _____

Section 5
Impressions/ suggestions
66. Would you like to add something about the issues addressed in the survey? Feel free to do so
Open answer

67. Leave us your email if you want to be involved in the next phases of the project or if you want to learn about the results. The data collection will help us identify some areas of Milan where we'll work with the help of the residents, through focus groups aimed at investigating the perception of safety further and imagining new spaces for everyone.
In accordance with the Privacy Policy Agreement, your email address will not be associated with your answers.
For any concerns

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For any questions regarding the survey and the STEP UP project, you can contact us by email: stepup-survey@transformtransport.org

Other information

To keep up with the progress of the STEP UP project, please visit our website and follow our social channels.

Recommended readings

Cities Alive: Designing Cities that Work for Women

Milano Atlante di genere / Milan Gender Atlas

If you are a victim of violence or stalking, call 1522: https://www.1522.eu/

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Annex VIII - Average ratings of Safety Factors by demographic group

			presence of an efficient lighting system	presence of visual obstructions (trees, bushes, cars, etc.)	possibility to see and acknowledge what is around you (wide field of vision)	possibility of being seen by other people	presence of escape routes	presence of surveillance systems (cameras, CCTV)	presence of emergency call devices	presence of police stations / patrols	presence of recognisable charging points for smartphones	negative reputation of the location	personal incidents of aggression / harassment	diverse presence of people of different ages, genders, backgrounds, etc.	presence of only men	presence of drug dealing activity	presence of people who are drunk / under the effect of drugs	presence of homeless people	presence of racialized people	presence of sex workers / prostitution	presence of open commercial activities	neglect of streets, pavements and public spaces (dirt, deterioration, etc.)	being near or inside a railway station	being at a tram/bus/metro stop	being in an equipped square (with benches, games, tables, public art, etc.)	presence of recognisable and open centers gathering	being in an urban park or a large green area	being in a disused urban area	being in a large open-air car park
men			0.13	0.55	-0.05	-0.09	-0.15	-0.31	-0.54	-0.38	-0.30	0.70	0.58	0.35	1.03	0.59	0.58	0.51	0.18	0.45	-0.08	0.30	0.63	0.35	0.18	0.03	0.66	0.53	0.66
Total responses women and gender minorities (aggregated)		(1667)	**3.85**	**2.08**	**3.87**	**3.82**	**3.84**	**3.42**	**3.86**	**4.20**	**3.06**	**1.54**	**1.35**	**2.81**	**1.44**	**1.47**	**1.27**	**1.95**	**2.09**	**2.43**	**4.16**	**1.94**	**1.63**	**2.48**	**3.02**	**3.91**	**1.69**	**1.24**	**1.55**
women and gender minorities																													
Age	18-25	23%	-0.05	-0.10	0.00	-0.18	0.06	0.01	0.09	-0.02	0.02	-0.18	-0.11	-0.16	-0.18	-0.07	-0.06	-0.11	-0.11	-0.04	-0.07	0.04	-0.25	-0.25	-0.05	-0.08	-0.03	-0.01	-0.08
	26-35	46%	-0.02	-0.03	0.00	0.04	0.04	0.02	0.05	0.02	0.02	-0.01	-0.02	-0.07	-0.06	-0.02	-0.02	-0.03	-0.09	-0.05	0.01	0.01	-0.06	-0.02	-0.04	-0.03	-0.05	-0.02	-0.03
	36-45	17%	0.08	0.07	0.02	0.09	-0.07	-0.13	-0.15	-0.15	-0.12	0.11	0.08	0.28	0.08	0.05	0.03	0.11	0.15	0.11	0.11	-0.03	0.15	0.16	0.12	0.16	0.04	0.01	0.06
	46-59	10%	0.06	0.11	0.06	0.09	-0.06	0.10	-0.08	0.15	0.01	0.13	0.09	0.15	0.29	0.07	0.05	0.08	0.22	0.08	-0.02	-0.10	0.33	0.20	0.05	0.02	0.08	0.04	0.18
	over 60	5%	0.04	0.26	-0.23	-0.02	-0.31	-0.04	-0.18	0.12	0.11	0.26	0.29	0.12	0.55	0.19	0.23	0.29	0.35	0.10	-0.15	0.04	0.52	0.46	0.04	0.03	0.28	0.10	0.09
Sexual orientation	bisexual	9%	0.08	-0.17	0.04	-0.15	0.06	-0.19	-0.16	-0.55	0.12	0.00	-0.10	0.30	-0.16	0.27	0.06	0.10	0.26	0.26	-0.01	0.06	0.01	0.07	0.19	0.23	0.04	0.05	-0.06
	heterosexual	85%	-0.01	0.02	-0.01	0.02	-0.01	0.03	0.03	0.09	-0.01	-0.01	0.00	-0.05	0.02	-0.05	-0.02	-0.02	-0.05	-0.05	0.01	-0.02	-0.01	-0.02	-0.03	-0.04	-0.01	-0.02	-0.01
	homosexual	2%	0.22	0.02	0.20	-0.18	0.02	-0.17	-0.08	-0.52	-0.02	0.39	0.22	0.40	0.13	0.17	0.16	0.41	0.31	0.57	0.01	0.49	0.16	0.34	0.16	0.30	0.10	0.36	0.24
	other	1%	0.15	0.00	0.08	0.05	0.29	0.08	-0.11	-1.04	0.03	-0.20	-0.10	0.31	-0.23	0.19	0.14	0.22	0.46	0.49	-0.16	0.27	0.12	0.22	0.31	0.25	0.23	-0.03	0.29
Ethnicity	other ethnicities	4%	0.07	0.06	0.08	-0.07	0.11	0.09	0.14	-0.15	0.19	0.04	-0.04	0.27	-0.03	0.13	-0.04	0.02	0.21	0.12	-0.02	0.08	0.10	0.01	0.11	-0.01	0.22	0.13	0.22
	white	95%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01
Religion	none	58%	0.02	-0.01	0.00	0.00	0.04	-0.06	-0.04	-0.15	-0.02	0.06	0.00	0.12	-0.03	0.10	0.06	0.10	0.11	0.15	0.04	0.05	-0.01	0.03	0.07	0.13	0.00	0.03	0.00
	christian	34%	-0.01	0.00	0.02	0.03	-0.04	0.10	0.09	0.23	0.03	-0.10	-0.03	-0.25	0.04	-0.16	-0.09	-0.16	-0.18	-0.23	-0.05	-0.06	0.02	-0.03	-0.11	-0.21	-0.04	-0.04	-0.02
	none/christian	2%	-0.09	-0.03	-0.06	0.07	-0.15	-0.08	-0.23	0.14	-0.08	-0.12	0.05	0.08	0.01	-0.03	0.04	-0.23	-0.17	-0.16	-0.06	0.06	-0.07	0.04	-0.15	-0.20	-0.05	0.05	0.08
	buddhist	2%	-0.05	-0.01	-0.11	-0.32	-0.26	-0.34	-0.33	-0.43	0.25	0.16	0.19	0.42	0.02	-0.05	-0.04	0.17	0.30	-0.08	0.10	-0.13	0.11	-0.14	0.21	0.32	0.01	-0.17	0.03
	other	1%	-0.20	0.32	-0.37	-0.07	-0.04	0.13	-0.06	0.25	0.24	0.01	0.10	0.69	-0.04	0.03	-0.07	0.25	0.16	0.47	0.24	0.01	-0.08	0.02	-0.22	0.14	0.16	-0.19	-0.15
Citizenship	Italian	96%	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
	non italian	4%	0.06	0.12	0.09	-0.02	0.08	0.20	-0.10	-0.04	0.18	0.11	0.09	0.00	-0.06	-0.09	-0.06	-0.11	0.11	0.01	-0.06	-0.12	0.04	0.07	0.13	0.02	0.18	0.01	0.05
Disalibility	disabled	2%	-0.09	-0.20	-0.32	-0.65	-0.37	-0.24	-0.22	-0.41	-0.11	0.29	0.21	-0.02	0.21	0.26	0.23	0.03	0.33	0.34	-0.25	0.33	0.23	0.02	-0.08	0.06	0.20	0.17	0.04
	non disabled	98%	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
Education	middle school certificate	1%	-0.21	0.09	0.36	-0.29	0.22	0.76	0.55	0.27	0.30	-0.01	0.01	0.19	0.21	-0.06	-0.16	0.00	-0.20	-0.13	-0.40	-0.05	-0.10	0.10	0.27	-0.44	0.49	0.05	-0.31
	high school diploma	17%	-0.17	-0.15	-0.04	-0.28	0.03	-0.03	-0.01	-0.09	0.00	-0.03	-0.03	-0.11	-0.04	-0.04	-0.02	-0.04	-0.04	-0.01	-0.19	-0.04	-0.05	-0.21	-0.05	-0.22	-0.01	-0.01	-0.02
	bachelor degree	20%	-0.09	0.05	-0.04	-0.11	-0.01	0.02	0.03	0.00	0.07	0.01	-0.01	-0.06	-0.05	0.03	0.05	0.00	-0.04	0.01	-0.03	0.10	-0.08	-0.03	0.00	-0.02	0.09	0.04	0.03
	first level master degree	36%	0.09	-0.01	0.03	0.09	0.01	0.02	0.02	0.05	-0.05	-0.02	0.01	0.00	0.00	-0.04	-0.02	-0.01	-0.02	-0.03	0.04	-0.01	0.01	0.07	-0.01	0.04	-0.05	-0.03	0.00
	higher education	26%	0.06	0.06	0.01	0.16	-0.03	-0.06	-0.06	-0.03	-0.01	0.03	0.01	0.11	0.06	0.06	0.02	0.05	0.09	0.04	0.11	-0.03	0.09	0.06	0.04	0.13	0.00	0.01	0.01
Economic status	I struggle to meet basic needs	5%	-0.10	-0.07	0.04	-0.22	0.13	0.07	0.14	-0.11	0.12	-0.04	-0.09	-0.12	-0.16	0.03	-0.06	-0.17	-0.10	-0.29	-0.04	0.01	-0.21	-0.29	-0.20	-0.07	-0.13	-0.04	-0.20
	I respond to basic needs	15%	-0.19	-0.05	-0.04	-0.23	-0.04	0.10	0.06	0.06	0.08	-0.06	-0.07	-0.21	-0.05	-0.13	-0.13	-0.13	-0.02	-0.04	-0.08	-0.16	-0.02	-0.18	-0.09	-0.14	0.06	-0.01	-0.02
	I meet secondary needs	57%	0.04	0.02	-0.01	0.04	-0.01	-0.05	-0.05	-0.06	-0.01	0.00	0.01	0.04	0.00	0.05	0.04	0.06	0.04	0.06	0.02	0.05	0.05	0.07	0.08	0.08	0.01	0.00	0.01
	I can access extra expenses	18%	0.09	0.03	0.09	0.18	0.07	0.04	0.04	0.17	-0.03	0.05	0.05	0.11	0.07	-0.03	0.00	-0.03	-0.07	-0.07	0.08	-0.02	-0.05	0.03	-0.08	-0.06	-0.07	0.02	0.06

*percentages don't sum up to 100% in all cases as responses of participants who didn't provide specific information on the categories were not taken into account

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Safe and accessible walking environments are crucial for sustainable urban mobility. However, traditional walkability assessments often overlook how user characteristics, particularly gender, influence perceptions of safety. The STEP UP project, awarded by Fondazione Cariplo (Grant No. 2022-1643), addressed this gap by investigating how women in Milan experience nighttime walkability. Women often navigate cities differently than men due to concerns about safety. Fear of violence or harassment can lead to precautionary behaviors like avoiding certain areas or using alternative modes of transport at night. These safety concerns significantly impact women's mobility and limit their access to essential services and social interactions. The STEP UP project employed a multimodal approach to understand the factors influencing women's perceptions of safety while walking in Milan at night.

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