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Journal of Land Use, Mobility and Environment

THE CITY CHALLENGES AND EXTERNAL AGENTS.
METHODS, TOOLS AND BEST PRACTICES

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The cover image shows a view of Hyde Park in London (United Kingdom) during the autumn season.
The photo was taken by Enrica Papa in November 2023.

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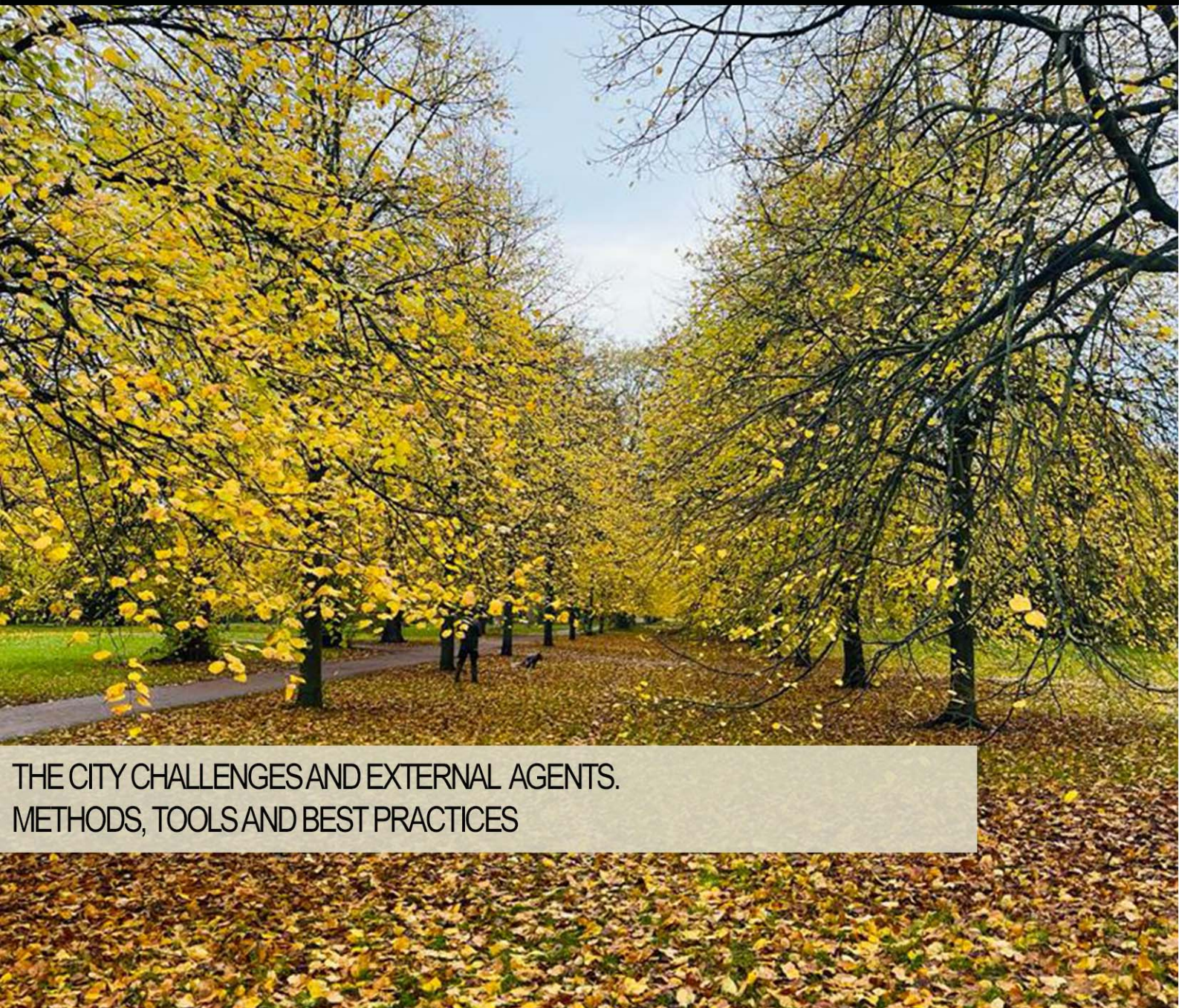
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REVIEW NOTES

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Digital data in support urban planning processes for the development of cities safe for women: an application to the city of Naples

Gerardo Carpentieri [a], Carmen Guida [a*], Andrea Gorrini [b], Federico Messa [b], Lamia Abdelfattah [b*], Benjamin Büttner [c]

[a] Department of Civil, Building and Environmental Engineering; University of Naples Federico II, Italy
e-mail: gerardo.carpentieri@unina.it; carmen.guida@unina.it
ORCID: https://orcid.org/0000-0002-2111-650X; https://orcid.org/0000-0002-8379-7793
* Corresponding author

[b] Fondazione Transform Transport ETS, Italy
e-mail: a.gorrini@transformtransport.org; f.messa@transformtransport.org; l.abdelfattah@transformtransport.org
ORCID: https://orcid.org/0000-0002-8086-9149; https://orcid.org/0000-0001-7479-119X; https://orcid.org/0009-0003-2069-4580

[c] TUM School of Engineering and Design Technical, University of Munich, Germany
e-mail: benjamin.buettner@tum.de
ORCID: https://orcid.org/0000-0003-4733-545X

Abstract
Urban planning is increasingly focused on solutions for sustainable urban mobility, including the achievement of "walkability", i.e. ease to walking, meeting criteria of neighbourhood services, street connectivity, comfort of public spaces, and others. Urban administrations in some countries, partially as a response to the Covid-19 pandemic, have adopted short and long-term plans for reassignment of vehicular space in favour of cyclist and pedestrian infrastructures, however traditional approaches to urban planning still fail to consider different categories of urban users in terms of their individual characteristics, which can significantly impact their perceptions of walkability for streets and public spaces. Women in particular face harassment, aggression and other safety concerns that can inhibit their mobility in streets and public spaces, especially when it gets dark. Despite robust research on other aspects of walkability in cities, there is a lack of knowledge regarding the intersections of mobility and gender. Addressing the need for further investment in qualitative, and particularly in quantitative analysis, the current contributions proposes and reports on the use of GIS-based methodology, with data collected directly from women in urban contexts, and from open-access location-based data, producing analyses that can support decision-making on policies for walkability. In particular, the contribution summarizes the first product of a new, replicable methodology, focused on urban planning and gender inclusion, applied to the city of Naples, Italy.

Keywords
Urban planning; Gender inclusion; GIS; Naples.

1. Introduction

The importance of urban planning for sustainable mobility is increasingly recognised. The goal is to create walkable urban environments, with accessible services, well-connected streets, and safe public spaces, and by these means discourage the resort to private vehicles and encourage environmentally friendly and space efficient modes of transport. However, the perceived levels of urban walkability are significantly dependant on the individual characteristics of the users, which are often overlooked in traditional approaches to urban and transport planning.

Urban and transport planning have long neglected the issue of the intersections between gender and mobility, resulting in severely inequitable accessibility to different city areas, with reduced opportunities for the female gender in particular. Recent studies have documented some of the differences between men and women in mobility behaviour. In the Italian context, for instance, women in are one and a half times more likely to walk on their daily trips than men, and are generally more diverse in their choices of transport modes (AitBihiOuali & Graham, 2021). At the same time, only one in 12 Italian women say they feel safe and comfortable walking at evening or night, while for men the ratio is one in four (ISTAT, 2022). These Italian data are consistent with comparable studies from other nations (Fiorelli & Zani, 2015; Hail & McQuaid, 2021; Sansonetti et al., 2021). Walkable environments, such as with populated and well-lit walkways, tend to increase women's sense of safety. Research has shown that women with access to walkable neighbourhoods are more likely to engage in regular physical activity, have better mental health, and feel more connected with their community. Additionally, walkable urban environments facilitate social interactions among neighbours and support local business communities. On the other hand, poor walkability limits mobility of the female gender, and in for the population in general, increases dependence on cars and negatively affects access to vital services and resources. When destinations are near, people will be more likely to walk as their sole means of movement, but walking also comes into play as a crucial component of longer journeys using private cars and public transport. Given all this, it is essential that policy-makers and urban planners pay close attention to the nexus of gender and walkability, meeting the relevant requirements.

Among other authors, Golan et al., Andersdotter Fabre et al., and Sethi and Velez-Duque have stressed how the experience of the urban environment differs for the two genders, partly because women are more concerned about harassment, aggression, and personal security in general. The individual's sense of personal safety bears significantly on their experience of urban environments, affecting their decisions on movement and transport. Women are constrained by the senses of vulnerability arising from real and perceived risks of violence and general harm, not only at night, and this constrains them significantly, hindering their mobility in public spaces. Women then assume avoidance behaviours and other precautionary measures, among which delaying or completely avoiding walking trips (Hille, 1999; Pain, 2000; Whitzman, 2013; Loukaitou-Sideris, 2014; Vera-Grey, 2018). This attitude, in a vicious circle, further segregates and disrespects the presence of the more vulnerable populations, leading even to the failure to provide for security in certain parts of the city (Gorrini et al., 2021).

Knowledge on the true needs and expectations of women as pedestrians, however, remains shallow. One of the problems confronting researchers has been the inadequacy of data collection by public authorities (Lecompte & Pablo, 2017; Pollard & Wagnild, 2017; Carpentieri et al., 2020; Carpentieri et al., 2023). Most data on gender differences in transport usage are very simply categorised, providing statistics solely in terms of the male/female variable, without further relation of those data to age, ethnicity, disability, caring responsibilities, etc. But gender-related needs in mobility are not homogenous, and so women must not be considered a uniform cohort subject to a sole set of needs. First of all, gender is a multi-dimensional and intersectional construct (Hail & McQuaid, 2021). Kimberlé Crenshaw (1989), in her critique of antidiscrimination doctrines, discusses "intersectionality" as the conception of overlapping effects of race, class, and other social identitieson shaping women's subjective experiences. This understanding would naturally extend to

experiences in urban mobility, not dictated by gender alone, but differing with the intersection of social identities, and where any who are "doubly-disadvantaged" would experience still more severe barriers.

Our research aims to analyse how women perceive urban environments, and to assess their sense of safety as an indicator of various urban factors, including physical, functional, socio-economic, and environmental elements. More specifically, the current contribution represents a first delving into the use of digital data to investigate any correlations among urban features and perceived safety. In particular, it will present a GIS-based methodology to build a comprehensive network based on data collected by a mobile app, which suggests the safest walking journey for women, and gathers the comments and assessments of the female users themselves. Such assessments and comments are usually made by younger adult women, and for this reason alone, the nature of the collected data hinders an overview of perceptions across the full age spectrum. The research strategy, therefore, also includes surveys designed to gain the views of a broader population, but these results too could be influenced by a heterogeneity of age not sufficiently representative of the general female population. In any case, even though the current research represents a first attempt at collecting data via such a digital platform, and analysing these in support of planning for urban safety, it still advances innovative methodologies and applies them in addressing a prominent data gap.

The following Sections 2 and 3 of this paper, respectively, provide a review of the current state of the art in applying digital data in urban planning and describe the methodology. Sections 4 and 5 describe the case study application to the city of Naples, Italy, and the results, and offer closing discussion and conclusions.

2. State of the art

Over the course of the 1900s, the attentions of urban planning revolved mostly around managing the consequences of rapidly increasing populations and sprawl. In the early 2000s, policy-makers and planners recognise additional, sometimes completely new challenges, including ones overlooked or consequential to past choices, and to address these, are developing new methods, techniques, and solutions. Apart from the universal effects of climate change and continued growth, entire cities or their parts can also experience economic decline, population loss, and strong shifts towards the older age cohorts. Depopulation and degradation exacerbate the perceptions of insecurity regarding the affected urban areas, especially among women, the older population and children, and tend to trigger phenomena of vicious circles.

Cities are complex and dynamic systems, meaning that even carefully planned developments can have unpredictable effects, both short and long term. Given the multiple, heterogeneous, inherited or corollary challenges facing those involved in the governance of urban transformations, it is therefore the duty of researchers to design and offer innovative tools, capable of supporting solutions to intertwined and nuanced problems, as well as the prediction of future challenges.

Geographic Information Systems (GIS) comprise a growing group of tools, now widely used in the measurement, knowledge-gathering and management of urban phenomena, and recognised as fundamental in governance of urban transformations. GIS hardware and software provide support in documenting and understanding urban phenomena, and in designing functional solutions to the identified problems. Within the panorama of GIS tools we can identify two major groups: those intended for prime use by policymakers, and those designed for direct use by city dwellers, within their specific contexts.

Two examples of tools designed for the policy and planning levels would be:

- The Transport for London WebCAT planning tool, a connectivity assessment toolkit that allows planners to measure urban accessibility levels (PTAL), calculated in terms of time required for arrival at public transportservices by foot or bicycle, in relation to specific localities. The same tool can be used to measure the coverage and reliability of transportation services within catchment areas, and from all this the degrees of accessibility attained in respect to public spaces. Measurement can be refined in terms of service at different times of day, but is not designed to consider the specific speeds, ease of interchange

   or crowding of the services. Still this is a tool that enables decision-makers to continuously check real-time travel services and their quality, and intervene where accessibility levels fall below standards (Adhvaryu et al. 2019; Thompson 2019);

— OpenRouteService, developed by the Heidelberg Institute for Geoinformation Technology on the basis of OpenStreetMap (OSM) data, permitting a wide range of applications in support of diverse scenarios. The Directions Service, for example, determines route and navigation information according to different criteria (e.g. cars, heavy vehicle types, bicycle types, walking, wheelchair; shortest route, recommended route). This service is in turn supported by a Geocoding Service, allowing programmed description of factors such as way types (i.e. main/secondary/special roads, paths, cycleways, etc.), surface types and gradients, etc. The Points of Interest Service can instead by designed to access online locational directories of specific kinds of places, products or services, and the Isochrones Service can be used to map catchment areas of services or infrastructure , with specified criteria of time accessibility (Franke et al., 2011).

We also provide two examples of tools aimed specifically at informing and empowering urban-area residents and users in conscious choices about mobility:

— Geo Open Accessibility Tool (GOAT), developed by Plan4Better start-up, for modelling of pedestrian and cycling accessibility, in consideration of the values of active local and city-wide mobility, the potentials of cycling and walking in achieving intermodal and sustainable mobility, and considerations of accessibility for persons of greater vulnerability and special needs. Citizens are able to intuitively measure and design their routes, achieving flexibility in planning their own travels. Again, based on OpenStreetMap data, GOAT allows users to choose various accessibility indicators, construct isochrones, or heat maps, spelling out different scenarios according to personal needs and preferences. The tool can immediately respond to effects on accessibility from construction of a new bridge or a new residential area, for example, or create travel scenarios for persons using wheelchairs (https://plan4better.de/en/goat/);

— Wheelmap, developed by the Sozialhelden NGO, and similarly based on OpenStreetMap data, enables disabled users to move more easily in urban areas (Mobasheri et al., 2017). The tool maps urban places in terms of wheelchairaccessibility. Using a "traffic light" grading system, it is the users themselves who rate and constantly monitor the accessibility of specific activities, services and places (https://wheelmap.org).

In observing the distinctions above, between tools intended for decision-makers and for persons engaged first-hand urban travel choices we observe a lack of hinge GIS applications capable of simultaneously: assisting users; collecting data; using that data to improve the performance of the tool as a support for urban planning and policy. One of the few examples that goes in this direction is the Collaborative Accessibility-based Stakeholder Engagement System (CoAXs), developed by the Massachusetts Institute of Technology, and used, among others, in the cities of Atlanta, Bogotá, Boston, Concepción, London, New Orleans, Pretoria, San Francisco, and Santiago: an interactive tool designed to draw in the active participation of stakeholders in the governance of urban transformation. Using a CoAXs app, citizens can simulate different scenarios of mobilisation, choosing modes of transport, their frequency and speed, and thereby visualising the accessibility of places and activities (http://coaxs.scripts.mit.edu/). CoAXs, however does not respond to the current research aim of accounting for users' perceptions of safety, except possibly by taking some other variable as a proxy. This is due in part to the very nature of the sought information, on perceptions of urban spaces, which has thus far limited the availability of data.

In the light of the poor availability of open-source data on perceptions of safety in urban environments, in support of both direct users and policy-makers, the research aims develop a replicable and scalable best practice methodology, location-based open and user-collected data. The expectation is that the reports and suggestions of app users themselves, as yet largely unexplored as a resource, can be developed as a reliable

database, serving in development of knowledge on urban and spatial characteristics with respect to perceptions and uses of individuals. The knowledge gained through such an app can provide take-aways supporting more inclusive and better functioning cities, in this case through data, analyses and considerations on women's safety and security, both real and as perceived.

3. Methodology

Scholars and practitioners have developed various methods for the measurement of walkability in urban environments, usually considering several factors, among which: availability and proximity of public services; overall sensations and experiences of comfort, security and safety; appeal of architectural-urbanistic design; aspects of social context. Very few of these methods integrate any measurement or other consideration in regards to gender. Indeed, in spite of theoretical proposals and arguments, there has been little empirical demonstration of any relationships between gender and the individual's experiences or perceptions of safety. The current study introduces a quantitative methodology for investigation of relations between matters of gender and urban spaces, in particular the computation of an index of safety, based on recorded data of women's experiences.

The data for calculation of the index are collected via the publicly-available navigation app "W-her",[1] which supports women in planning their walking journeys by considering the opinions and suggestions of other users on the security of places and routes. The app, initially developed by Italian researchers, is now maintained and operated by Walk21 Foundation, a charity registered in England-Wales.[2] The app solicits data on women's perceptions of safety in urban spaces and streets in terms of three ranked options (*Go easy*, *Be careful*, *Avoid*), relative to three times of day: *Day* (06:00-20:00)*, Evening* (20:00-24:00), *Night* (24:00-06:00) and also logs comments that could in any way help others in their mobility planning.

The methodology presented is the early product of a comprehensive research project delving into gender-related issues, including the specific aspects of relationships with urban environments. The analysis is conducted using a GIS that relates the W-her data to reference spatial units at the level of the "census tract", for which we can also access social and economic data on the resident population, as collected by the Italian National Institute of Statistics (ISTAT, 2011).

The methodology is articulated in five steps. The first step is that of data collection, using two investigative instruments: digitally, via the W-her GIS app and "traditionally", via a questionnaire. The design and application of the questionnaire are aimed at gaining information on areas where coverage in the W-her database is insufficient, and then collating the information from the two sources. In particular, the questionnaire has been designed to minimize any differences with data collected by W-her app.

The second step involves checking the sufficiency of the data coverage from the two sources, and their merging.

In step three, the data on perceived safety data are harmonized with the GIS spatial units corresponding to census tracts, and from there related to the administrative level spatial units, with the aim of usefully informing the decision-making of local authorities.

$$i_s = \left(\frac{L_1}{L_{Tot}} \cdot S_1 \right) + \left(\frac{L_2}{L_{Tot}} \cdot S_2 \right) + \left(\frac{L_3}{L_{Tot}} \cdot S_3 \right) \tag{1}$$

The fourth methodological step is the measurement of the summary Index of Safety (i_s), which considers the safety perception of women experiencing urban spaces according to formula (1). The i_s is calculated for each

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[1]   For more information visit https://Wher.com/
[2]   For more information visit https://walk21.com/

ISTAT census tract. The L_1, L_2 and L_3 correspond to the length of the streets within the census tract, each one classifiable in terms of the three ranks of safety. The total value of length of streets for each census tract is L_{Tot}, while S1, S2 and S3 correspond with the safety ranks *Avoid*, *Be careful* and *Go easy*, respectively set equal to 0, 0.5 and 1.

The product of the fifth and final step is the categorization and illustration of the different safety levels for women, in GIS maps. Our approach, aimed at providing an accurate representation of the safety levels in the reference area, involves the application of the Natural Breaks (Jenks) methodology, thereby computing the index values in terms of five categories, from Level 1 (Avoid) to Level 5 (Go *easy*). Apart from immediate service to users, the representation of safety ratings for streets and other urban spaces will also serve in further statistical and spatial analyses for the investigation of gender-based realities and perceptions on mobility.

The proposed methodology is validated through a study on the case of Naples, as reported in the following section.

4. Application

The selection of Naples for the purposes of case study considers a number of factors, first of all its rank as third in population size among Italian cities and fifth in population density. With 913,462 inhabitants (ISTAT, 2022) distributed over an area of 119.02 km^2, the average population density is slightly over 7,600 persons per km^2. Certain districts of Naples record population densities among the highest of all Europe. The city is divided into thirty administrative neighbourhoods, grouped in turn into ten municipalities.

The urban area of Naples presents a substantial range of socio-economic and morphological characteristics. On the basis of these differing attributes, the urban fabric can be categorised into three fundamentals types or zones: Central, Semi-central and Peripheral (Fig.2).
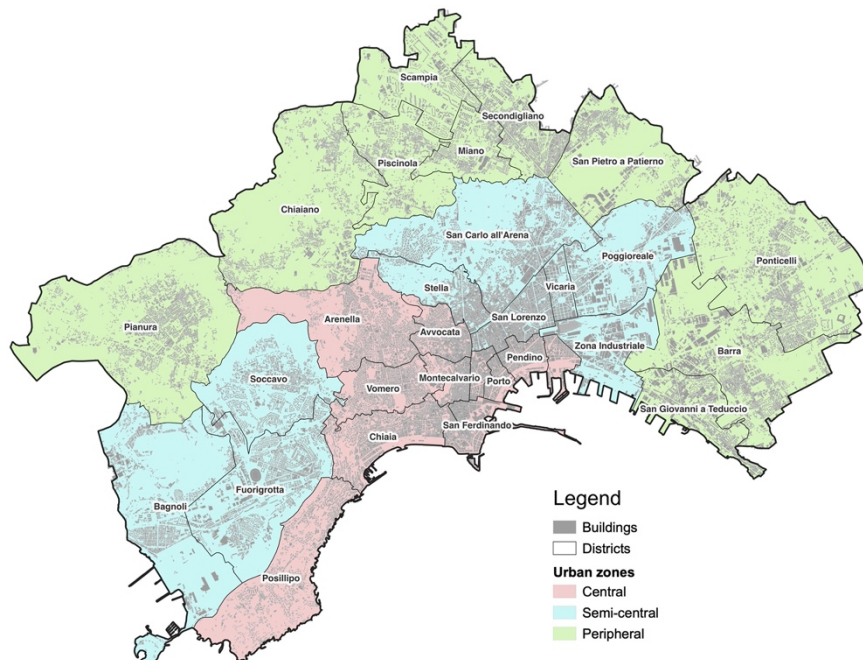
**Fig.1 The thirty administrative districts in the City of Naples are classified into three urban zones**

The Central zone, focused around the original Greco-Roman port, has a high population density and excellent accessibility to public and private services, including commercial and administrative functions. The fabric of Semi-Central type (Fuorigrotta, San Lorenzo, Vicaria and Bagnoli), descends from development beginning in

the first half of the 20th century, typically including certain industrial activities, services of supra-municipal interest, and residential areas with of regular structure. The peripheral areas, instead developed in the second half of the 20th century, are primarily residential, but with irregular urban structures and some of the lowest levels of accessibility to services. This classification is provided by the Italian Agenzia delle Entrate (2023) and it takes into account physical and functional urban features, as well as neighbourhoods administrative boundaries.

The residents of Naples include 474,264 female persons, comprising 51% of the total population (data from ISTAT 2022). Table 1 provides data on the distribution of females by census tract and zone (data from ISTAT 2011 Census). At the level of the three urban zones, the distribution of the female population is almost equal in terms of number: 153,491 in the Central zone, 175,448 in the Semi-central and 176,967 in the Peripheral zone. At the district level, however, the distribution is not uniform by number, since: the sizes of these can be very different; some districts include substantial industrial districts; others have been assigned to more concerted housing development.

Urban zone	District	Female population
Central (153,491 inh.)	Arenella	37,123
	Avvocata	17,679
	Chiaia	20,935
	Mercato	4,891
	Montecalvario	11,972
	Pendino	8,727
	Porto	2,556
	Posillipo	12,407
	San Ferdinando	9,773
	San Giuseppe	2,753
	Vomero	24,675
Semi-central (175,448 inh.)	Bagnoli	12,244
	Fuorigrotta	38,458
	Poggioreale	12,471
	San Carlo all'Arena	36,465
	San Lorenzo	25,043
	Soccavo	23,665
	Stella	15,930
	Vicaria	7,927
	Zona Industriale	3,245
Peripheral (176,967 inh.)	Barra	18,717
	Chiaiano	12,133
	Miano	12,389
	Pianura	29,361
	Piscinola	14,179
	Ponticelli	26,913
	San Giovanni a Teduccio	12,534
	San Pietro a Patierno	8,864
	Scampia	19,702
	Secondigliano	22,175

Tab.1 The women population distribution in the different districts grouped by urban zones

This descriptive analysis of the females present in Naples does not account for non-residents who work or engage in other activities within the city, on which no data is currently available. It should be noted that the national census of labour activities does not allow access to data on worker gender. Although the lack of this data represents a critical limitation, affecting the reliability of the results and conclusions of the current study,

the method of gaining insight into the safety perceived by women in Naples still provides insight and understanding of the complex interplay of socio-cultural factors affecting their experiences of the urban space, and can support policymakers and urban planners in the design of more inclusive and safe cities for everyone. Since 2019, data on safety issues in Naples have been collected under a partnership between the coordinators of the W-her App and the researchers of two institutions: the Laboratory of Land-Use, Mobility and Environments (TeMA Lab) of the Department of Civil, Building and Environmental Engineering of the University of Naples 'Federico II', and the non-profit Transform Transport Foundation, based in Milan.

The W-her app (https://W-her.com/) was first used for data collection on the safety of streets and spaces with university students, then with women both resident in Naples and present as non-resident users of city streets and spaces, such as for work. The data collected from more than 3,000 assessments referred to over 45% of the city street network (Fig.4). On-site interviews were also conducted with women present in specific city streets, focused in particular on collecting information on their perceptions of safety for spaces in areas of lesser data from the W-her App, and also aimed at obtaining responses from women not typically participant in "app based" projects. Of the 813 interviews conducted in this manner, 560 were with Neapolitan residents, of which 52.1% rated their location of the moment as *Avoid,* while 13.5% indicated *Be* careful and 35.4% *Go* easy; instead, for the subsample of the 253 non-resident women, the respective shares of responses were 25.9% *Avoid*, 26.3% *Be* careful and 48.8% *Go* easy.
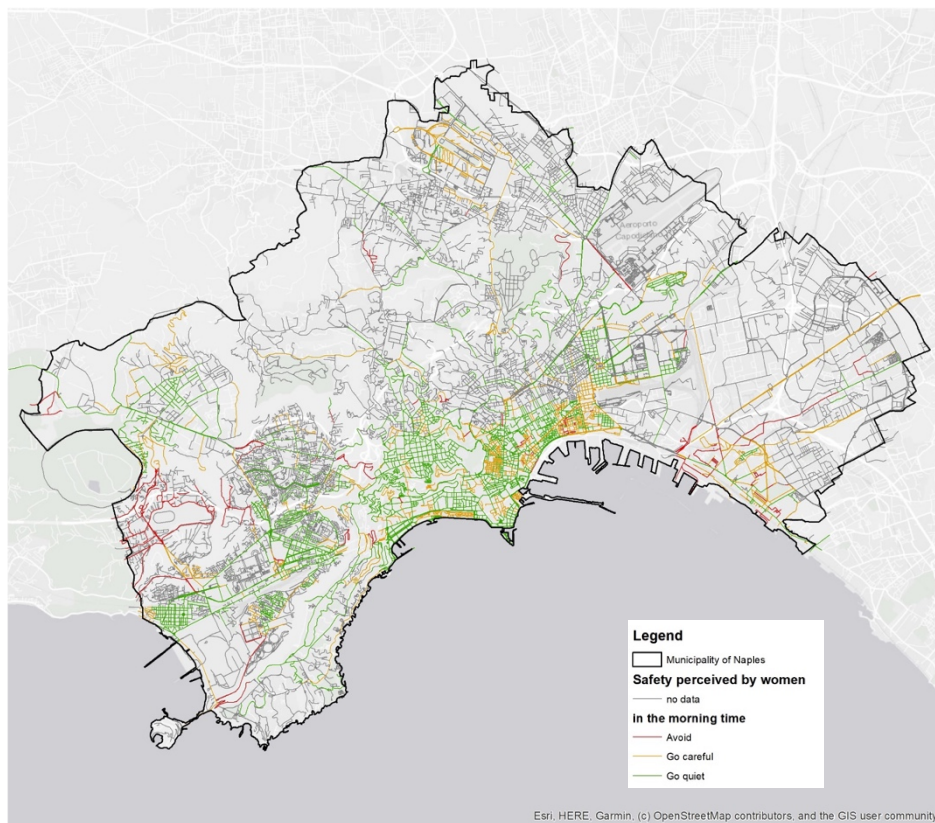
Fig.2 City of Naples: safety assessment of the street network (Evening scenario) by W-her App data

4.1 Results

In this paragraph, we present the results obtained by measurement of (i_s) for each census tract of the study area, under the three scenarios, *Day* (6 a.m. – 8 p.m.)*, Evening* (8 p.m. – 12 a.m.)*, Night* (12 a.m. – 6 a.m). The three scenarios are useful to highlight how the perception of safety in urban environments vary during a day according to lightning but also to number and kind of activities carried out in cities. Figure 3 provides the mapping of the Index of Safety, by census tract, for the three scenarios. The maps reveal the presence of

perceptions of greater safety (higher i_s) for the Central zone and some adjoining residential areas, for example in the western part of the city (Semi-Central), versus perceptions of lower safety in most Peripheral districts. Looking in more detail, women tend to consider almost all parts of the Central zone secure, with only two of its census tracts, both near its outer edges, classified as Level 1 (Avoid). In contrast, in the Peripheral districts, women rate very few parts as secure, and these tend to coincide with the three census tracts of Pianura, Secondigliano and Ponticelli, which are also the most densely populated and residentially structured.

The districts with the perception of highest safety during the three scenarios are San Ferdinando, Posillipo, Vomero and Chiaia.

(a)

(b)

(c)
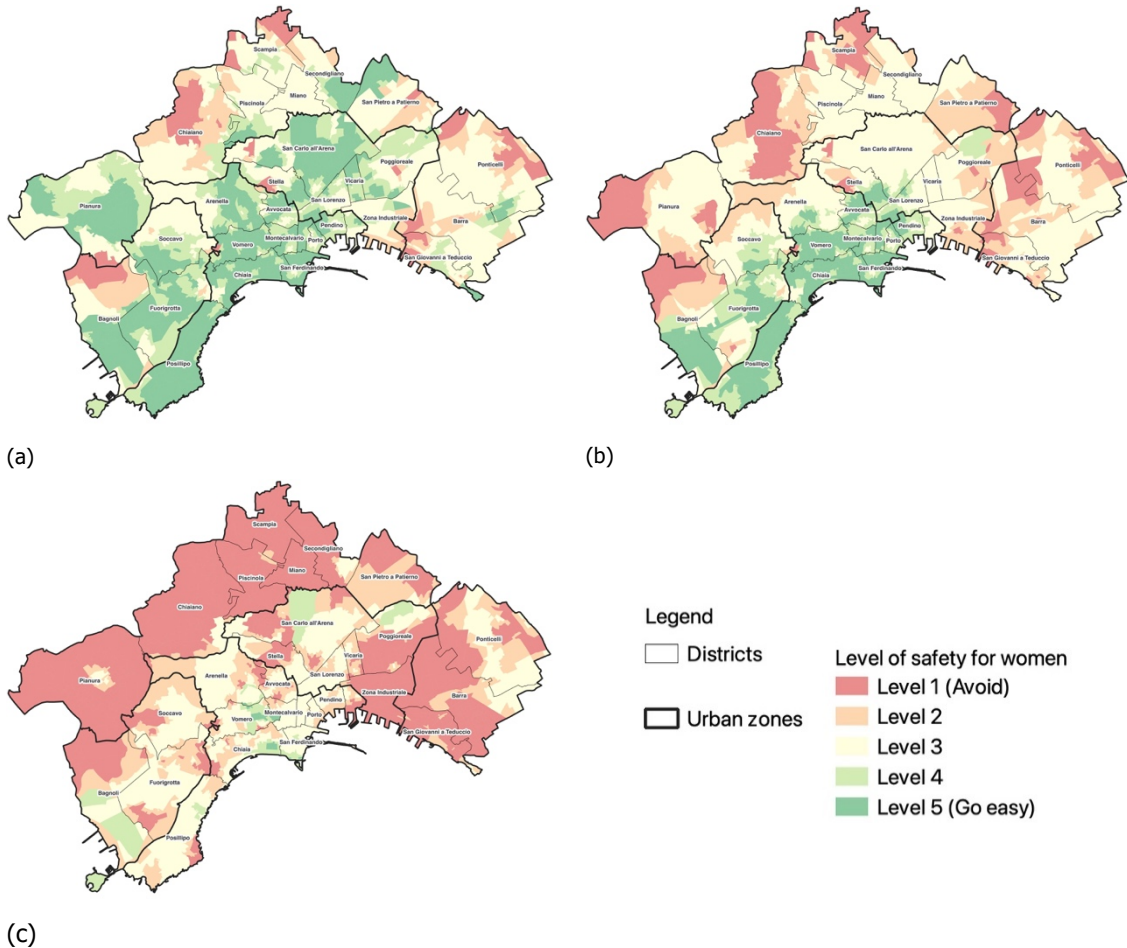
Fig.3 Maps of the Index of Safety for all census tracts of the city of Naples under the three scenarios: a) Day, b) Evening, c) Night

The proposed methodology can also be used to gain deeper understanding of women's perceptions of safety by comparing, at the district level, the measurements of i_s at the three times of day.

Fig.6 presents the measurements of i_s for the urban districts of the Central, Semi-Central, and Peripheral zones at the three different times of day. In all urban zones the results demonstrate a significant reduction of perceived security in the night scenario, with this reduction most pronounced in the Peripheral districts of Miano, Piscinola, Scampia and Chiaiano. The graphing reveals that for the Central and Semi-central zones there is only a minimal difference in i_s between the Day and Evening scenario, while for Night, i_s drops by roughly one half. At the right side of graph, we show the distribution of female population among the various districts, for better communication of the cumulative impacts of women's perceptions of safety. This type of reporting, relating data on female population with values of i_s, can support decision-makers and urban planning and service managers in developing and implementing effective strategies and practices promoting higher quality of life for this and other vulnerable categories.

Looking at the districts of the Central zone, for example, we observe similar values of i_s in the transition from the day to evening scenario, except in Mercato and Arenella districts, where we observe a significant drop, with direct consequences for the over 41,000 resident women.
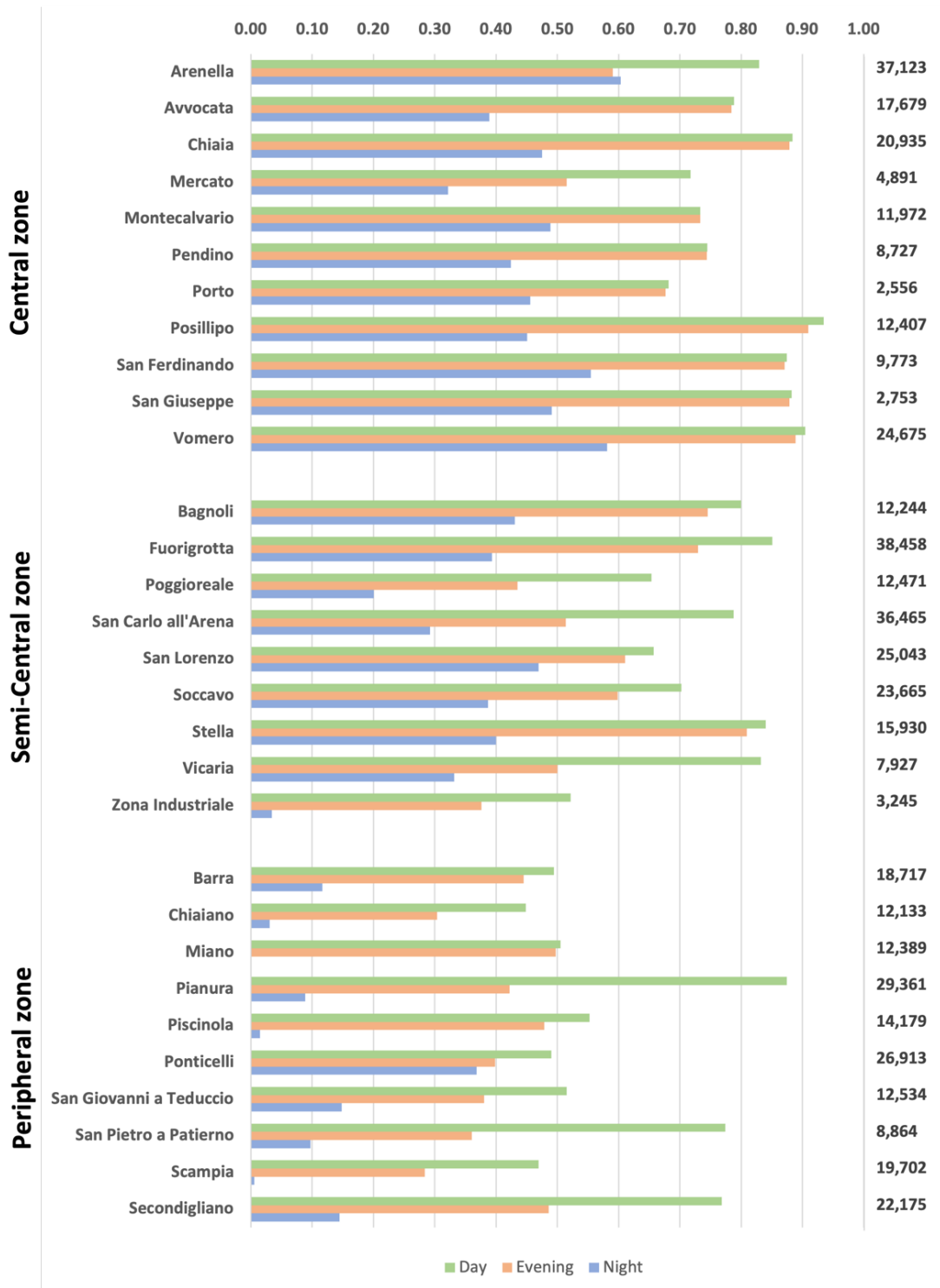
Fig.4 Index of Safety for districts of Naples under Night, Evening and Day scenarios, with associated distribution of the female population

The results obtained for Semi-Central districts, similarly to the Central districts, in general show a halving of the values of i_s from the Day scenario to that for Night. Moreover, there is a significant reduction in the index from Day to Evening, for the districts of Vicaria and Poggioreale.

For the Peripheral zone, we see that the most populated districts (Pianura and Secondigliano) suffer a great reduction of i_s values safety from the Day to the Night scenario, indicating that there would be particularly significant impacts on freedom of life and movement for women present in the urban spaces of these districts. The Ponticelli district presents a typical "Peripheral" value for Day i_s but unusually with only minimum differences between the observed values for Evening and Night.

5. Discussion and Conclusions

United Nations Sustainable Development Goal 11 is "making cities and human settlements inclusive, safe, resilient and sustainable" (UN, 2015). To ensure equitable and safe access to mobility and city services for all, the conception and planning of sustainable urban mobility must consider the gender dimension. The lack of safe mobility options for women in urban areas not only restricts their access to essential services, but also their participation in economic and social activities. Women's choices concerning mobility are significantly impacted by factors such as time of day, frequency of public transit, and the contributions of services and other infrastructure to safety. As heavier users of public transit, for example, women's choices in terms of time of movement are influenced by factors such as expectations of overcrowded and unsafe conditions; whereas their choices of entry into a particular urban space will be influenced by perceptions of its safety at the different times of the day. Negative perceptions of safety in terms of gender-related assault or harassment are particularly critical, and can severely restrict the mobility of women. Given known and perceived risks of gender-related violence, women are more willing than men to modify their personal behaviours, their travel routes, and to avoid certain public spaces, for both mitigation of the real risks and preservation of their feelings of safety and tranquillity. Such choices ultimately impact the overall mobility experiences of women and their general quality of life.

Despite the fact that women face unique challenges in urban environments, with direct impacts on mobility experiences and choices, traditional approaches to urban planning often fail to address the intersections between gender and urban mobility, resulting in inequitable accessibility and reduced opportunities. Decision makers and practitioners must therefore take up a gender-responsive approach, prioritising the needs and experiences of women. Policies on infrastructure investment, outreach programs, and other targeted strategies can ensure that women achieve equitable access to safe, reliable, and affordable options of mobility, with consequent reductions in gender inequalities, and ultimately, more sustainable, inclusive, and thriving cities for all. The current research explores the safety perceptions of women in urban areas, applying an innovative methodology, combining georeferenced data on women's perceptions of safety collected via mobile apps, with data obtained by traditional methods, such as questionnaires and interviews. The results presented in this contribution represent the first experimental product of a comprehensive research project delving into gender-based issues in the context of urban environments. The methodology presented is derived in part from the know-how of the ongoing research project "STEP-UP - Walkability for Women in Milan" (Grant No. 2022-1643), financed by Fondazione Cariplo under the call for proposals "Inequalities Research – Generating new knowledge to reduce inequalities". In particular, the STEP-UP project is aimed at (a) the identification of challenging areas and neighbourhoods in Milan considering the needs and expectations of women while walking, and (b) providing an analytical testbed for the development of a set of policy recommendations aimed at enhancing walkability for women in cities. From a methodological perspective, the STEP-UP project aims to bridge the gaps in data availability by drawing on diverse sources, both quantitative and qualitative, for better understanding of how different women walking in the same city perceive safety differently across space and time.

For the particular case of Naples, the results of the current study reveal the relevance of (i) time of day, and (ii) location with respect to the urban centre, on women's perceptions of safety while walking. While a significant reduction of sense of safety is observed during night-time in all parts of the city, this drop was

generally found to be sharper in peripheral areas compared to central and semi-central areas. These observations, and the methodological ability to ascertain them, have vast implications on the study of women's perceived safety in urban contexts in general. Among other conclusions, the study reveals that to address the needs of women, it is important develop location-specific and temporally differentiated policy and designs for mobility.

By prioritizing environments of safety, connectivity, and access to public services, policymakers can contribute to the empowerment of women, and in general, promote the development of more equitable and sustainable cities. Addressing gender inequality in urban mobility is crucial to achievement of the United Nations Sustainable Development Goals and the development of more inclusive and liveable cities, for all.

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Author's profile

Gerardo Carpentieri

He is an engineer, Ph.D. in Civil Systems Engineering at the University of Naples Federico II and Lecturer in Land Use Planning at the Department of Civil, Architectural and Environmental Engineering of the University of Naples Federico II. From 2020, he is a member of Unina research group for the ERASMUS+ Key Action2: Project "Development of a Master Programme in the Management of Industrial Entrepreneurship for Transition Countries" (MIETC). From 2023, he coordinate Unina research group for the project "STEP UP- Walkability for Women in Milan" financed by Fondazione Cariplo.

Carmen Guida

She is an engineer, PhD in Civil Systems Engineering and Researcher at the Department of Civil, Architectural and Environmental Engineering of the University of Naples Federico II. Her research activities concern adapting the urban environment to climate change-related hazards and accessibility to urban services for older adults to minimise social exclusion and inequalities within urban areas.

Andrea Gorrini

Head of Research at Fondazione Transform Transport ETS, a non-profit research foundation launched by Systematica in April 2022 and focused on innovation in mobility and transport planning. He is an environmental psychologist with research experience in human behavior in transport systems, pedestrian crowd dynamics and walkability. He oversees research and development activities related to the identification, collection and exploitation of different mobility data sources.

Federico Messa

Senior Researcher at Fondazione Transform Transport ETS and Senior Transport Consultant at Systematica. He is an architect, and he has been active as a transport consultant on a diverse set of projects, ranging from territorial studies to masterplans and complex buildings mobility strategies. He is also involved in architecture and mobility research studies, mainly related to urban dynamics, mobility data analysis and visualization, project performance analysis and spatial analysis.

Lamia Abdelfattah

Senior Researcher at Fondazione Transform Transport ETS and a Senior Transport Consultant at Systematica. She is an architect by background and an urban planner by profession, focusing on issues of spatial equity in cities. With a background in participatory urban planning in informal settlements, her work is grounded in theories of urban justice and inclusive city perspectives.

Benjamin Büttner

Benjamin Büttner is the deputy chair of Urban Structure and Transport Planning and is the head of the Research Group on Accessibility Planning at Technical University of Munich (TUM). Currently works in the fields of accessibility planning and decision and policy making. Urban transitions, tactical urbanism and street experiments are the foci of his professional skills. Since 2019 he is the head of the EIT Urban Mobility "Doctoral Training Network" which includes 90 interdisciplinary PhD students all over Europe. Since 2020 he is the founding Editor-in-Chief of the Journal of Urban Mobility.