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Urban Inequalities

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User-centred mobility management and social inclusion. Urban insights from the University of Genoa

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Abstract
Although constituting one of the basic individual rights, mobility has been considered for long a given service users should adapt to. Nevertheless, increasing customization needs have recently emerged, so that user-centered paradigm has progressively gained relevance. Demand-Responsive-Transport, as well as Mobility-as-a-Service solutions are often introduced to meet specifical users' groups and targets transport demand. Contemporary individual needs require to shape indeed mobility services and respective management strategies within a wider welfare perspective, in order to assure universal access to facilities and opportunities. Thus representing a quite critical challenge on a urban level, Universities may constitute an interesting case-study to develop integrated strategies addressing accessibility, inclusion and equality within a more limited, though comprehensive community. Present contribution will therefore provide an holistic methodological approach to support sustainable and inclusive mobility management planning and actions, starting from the University of Genoa experience, currently implementing dedicated tools and strategies, thus investigating potential extension to Genoese urban context.

Keywords
Social inclusion; Equality; Diversity; Mobility management; Accessibility.

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1. Introduction

Mobility is listed among basic and essential rights by several national fundamental laws and constitutions (Wickham, 2006). It plays indeed a pivotal role both referring to the individual opportunities of a lifetime and to territorial accessibility and consequent regional development (Schwanen et al., 2015), as well. Nevertheless, traditional approach to transport services has been a standardized one for long. One-fits-all solutions were designed without specific concerns about territorial features and users' individual needs, being urban-rural nature of the service the only variable, acting on vehicles requirements and service frequency.

Nevertheless, similar approach is progressively failing in meeting local mobility demand due to several reasons:

- population ageing in Western countries and consequent accessibility emerging issues, as the elderly may find more difficult to drive personal cars through urban and rural contexts (Shrestha et al., 2017);
- Strong urbanization processes, thus leading to progressive depopulation of inner and remote areas (Qin & Fukuda, 2023);
- public expenditure rationalization, requiring to optimize public transport services, thus supporting sustainable transition and modal shift, as well (Ryley et al., 2014);
- inclusion and diversity auto-determination needs, as population segment formerly segregated may now access autonomously new opportunities, thus benefiting from Universal Design principles affirmation and spreading (Hidayati et al., 2021).

A deep change in transport schemes and mobility supply is therefore needed (Aarhaug, 2019): service customization may prove essential in meeting both individual and local territorial necessities (Xu et al., 2022). Similar premises progressively led to the re-design of transport services on a user-centered basis.

On a urban level, Demand-Responsive-Transports (DRT) were firstly introduced to extend time and space service coverage, reducing operating costs where transport demand proved to be weak and dispersed in time, density or targeted users (Mounce et al., 2017). User-centered approach led then to the implementation of Mobility-as-a-Service (MaaS) solutions (Kostiainen & Tuominen, 2019), overcoming traditional barriers of transport services-urban/rural, public transport/sharing services- to implement multi-modal, integrated thus individual options, relying on the possibility to design, book and buy tailored solutions to move from point A- to point B according to personal needs and preferences (D'Amico, 2023).

A similar user-centered approach may target a more universally accessible and inclusive territorial system (Muller & Meyers, 2019), where mobility, equality, diversity and inclusion issues may be faced jointly. Nevertheless, evidently, a deep mindset change is required from policy-makers, providers and users (Lyons et al., 2019), as well.

In this direction, universities and research centers may play a pivotal role, as key-actors of change in several fields (Altun & Zencirkıran, 2023): sustainable and inclusive mobility (Cappelletti et al., 2021), accessibility, gender equality (Rosa & Clavero, 2021). Despite strong commitment, these challenges are usually targeted separately and potential synergies may be missed.

University of Genoa, for instance, has recently addressed accessibility and inclusion issues through three different tools: Home-University Commuting Plan (HUCP), Positive Actions Plan (PAP) and Gender Equality Plan (GEP). The first one targets sustainable modal shift and environmental footprint reduction concerning university students' and employees' mobility; the second aims at enhancing social inclusion and diversity within university community; while the third one addresses directly community gender balance.

Despite constituting significant actions towards respective aims, complying to specific prescriptions and goals, nevertheless, a more holistic view should be enhanced to support an overall evaluation and planning process shaped around users.

Increased attention paid to individual needs, beyond pre-defined classification and profiling, requires indeed to mainstream non-mobility strategies and targets, as well. Diversity and equality-led actions to support

specific groups inclusion should be integrated within sustainable mobility framework (Fondazione Brodolini, 2023).

Universal accessibility should represent the ultimate goal of university planning to tailor flexible and custom solutions able to meet personal needs as MaaS-provided solutions on a urban level, thus targeting Mobility-as-a-Welfare (Munarin & Tosi, 2012) as potential extension of this approach.

University community may represent interesting testbed to develop initiatives matching specific groups needs (e.g. women, the elderly, people with disabilities, visiting students or personnel) without designing ad-hoc (thus segregating) solutions (Lee et al., 2021), but through a holistic and flexible mobility system to be shaped around users preferences and requirements. Similar challenges are currently guiding the implementation of a Genoese University MaaS pilot able to target specific and wider goals through an innovative, responsive and seamless approach.

Present contribution will therefore focus on user-centered mobility paradigm and strategies (Section 2), thus introducing University of Genoa case-study (Section 3) as a test-bed for the implementation of an integrated framework addressing users' mobility patterns and respective mobility management initiatives within a wider range of actions concerning inclusion and accessibility (Section 4). Final considerations will be provided in terms of urban potential up-scaling of present approach (Section 5) together with conclusive remarks (Section 6).

2. User-centered mobility paradigm and strategies

Services customization constitutes currently the predominant paradigm almost within every urban sector. From entertainment, to basic needs (e.g. electricity, mobility, water supply…), tailored solutions are provided to meet precisely individual necessities. Despite centralization and standardization have been the main strategies to grand widespread and effective service provision within urban areas, diversity in both users' targets and respective needs ask now for a different approaches to ensure accessibility, inclusion and equality (Ding & Keh, 2016).

The object-as-a-Service (Cherrier & Ghamri-Doudane, 2014) mode is offered as an effective way to profile users and provide them customized solutions to their specifical demand.

As far as mobility is concerned, it should be highlighted how accessibility may prove significantly variable according to physical, age and personal conditions. It has been largely investigated how any kind of individual impairment may lead to longer travel times, un-sustainable modal choices or to the impossibility to reach some places and facilities, thus limiting individual opportunities and potentialities (Andújar-Montoya, 2016).

At the same time, significant differences in mobility patterns may be traced also on a gender basis (Brown et al., 2014). Due to respective traditional role within societies, as well as personal perceptions and behaviours (Delatte et al., 2018), men and women actually show different ways to move across the city (Cresswell & Uteng, 2016), both in their modal and route choices (Gauvin et al., 2020).

Inclusive and equitable mobility management should therefore consider similar variables (Ng & Acker, 2018), thus trying to achieve universal accessibility by meeting individual patterns and needs.

In this direction, several solutions have been provided in terms of transport and mobility services. DRT represents indeed one of alternatives to provide customized door-to-door mobility and consequent universal accessibility. It has been widely used to increase targeted groups accessibility (e.g. children, the elderly, people with disabilities) to basic services and facilities. Although benefitting from current technology advancements it constitutes quite a traditional solution to face specifical needs, thus leading to several claims in terms of "segregation" of users that may be framed as more vulnerable than others (Delponte & Costa, 2022).

On the other hand, MaaS represents a quite popular and investigated scheme to re-define urban mobility according to individual requirements. Through an integrated digital application similar solutions provide indeed

tailored travel planning, booking and purchasing alternatives to move from point A to point B within urban or metropolitan area (Maas, 2022).

In this case, a universally-accessible and customized service would be potentially provided independently from personal conditions and needs (Dadashzadeh et al., 2022), thus overcoming ad hoc-solutions approach. Individual tailoring of routes and mobility alternatives should be provided by default, independently from physical and social vulnerabilities.

In this direction, two relevant aspects need to be pointed-out:

- mobility services customization requires strongly data-driven profiling procedures. MaaS applications may indeed define tailored-solutions for users that have been previously targeted in terms of mobility patterns, preferences and needs;
- data collection and management need to be performed effectively, thus requiring strong computing processes and particular attention in terms of privacy protection (Callegati et al., 2016);
- mobility tailored solutions represent only one side of the coin as far as sustainable development and universal accessibility are concerned. Integrated strategies should be provided, being mobility the pre-condition to multiple opportunities and activities through a welfare perspective (Marchigiani, 2022). Significantly, MaaS solutions finally aim at achieving "societal goals" thus going beyond transport-related services provision (Macedo et al., 2022).

3. University of Genoa commitment

In order to face these two main challenges, it could be useful to identify limited though representative communities to work as test-beds to define and implement integrated frameworks for sustainable, integrated and inclusive mobility management (Karvonen et al., 2018).

In this direction, Universities may play a pivotal role.

Due to their greater attention to sustainability (Trencher et al., 2013), inclusion and diversity, they could represent an initial case-study to develop innovative approaches and practices to be later extended to wider urban environments.

In particular, present work will focus on the University of Genoa (UniGe) and its commitment both in terms of sustainable mobility and gender equality and inclusion.

University of Genoa counts approximately 30,000 students, 1,000 PhD students, 750 researchers, 860 Professors and 1,250 technical and administrative workers.

Altogether they represent 6% of total amount of Genoese population, thus constituting a quite relevant share of local commuters (Romanowska et al., 2019).

Their relevance in terms of mobility is made even more crucial since the University is not located in a single campus, while classrooms and offices are distributed across the whole city centre of Genoa, as well as outside the city in Savona, Imperia and La Spezia.

Being University-related flows so significant, and due to Italian Law 77/2020 -concerning mobility management for companies and administrations counting more than 100 employees-, University of Genoa appointed its own mobility manager in 2021 and approved in 2022 its Home-University Commuting Plan (HUCP).

Nevertheless, looking at local university community as a smaller, though representative scaled reproduction of the wider urban community, it must be remembered that several groups and necessities need to be met.

First of all, if we look at students and workers, men and women are present in different shares (Fig.1). It is therefore evident that different roles within university, as well as within wider society, constitute a strongly influencing factor for individual needs in terms of economic resources availability and consequent willingness-to-pay, as well as travel patterns and behaviours that need to be specifically investigated through dedicated surveys.

Fig.1 Gender balance within UniGe Community

In details, it is interesting to point out how students and workers show deeply different gender structure: women prevail among the former ones, while looking at employees' data men gain majority shares more and more ascending organization ladder, thus making age and role-related gap even more critical. Similar data show critical, thus not surprising (Falco et al., 2023), decrease of women share in higher positions, but at the same time, they reflect the strong commitment by UniGe and the significant evolution across the decades, progressively reducing gender gap, thus making extremely necessary gender-sensitive measures to support the encouraging trend reversal. Similar gender structure within UniGe community was therefore addressed through Gender Equality Plan (GEP)[1] initiative, to support gender balance, especially for workers, since students only show greater female share within their group.

[1] Available online at: https://unige.it/en/unige_gep

In this direction, mobility patterns of the different segments of UniGe community may vary significantly not only on an age, income and route basis, but also according to gender-related aspects, that may have been underestimated so far. Although some researchers have already pointed out the relevance of similar factors within academic institutions (Cañibano et al., 2016), University operational planning tools still struggle to include gender-related data into mobility management policies.

On the other hand, on a strategical level, remarkable effort has been made to develop the Positive Action Plan (PAP)[2], that defines several lines of action -namely context analysis, welfare, education, teaching, communication- to mainstream equality and inclusion issues into University planning and programs.

Present tool includes strategies concerning vulnerable workers commuting mobility, in terms of accessibility and sustainable modal choices, as well as references to on-going projects regarding students sustainable mobility.

Despite the holistic approach towards diversity, inclusion and accessibility here provided, strategies are later implemented through the above mentioned operational tools (HUCP and GEP), that currently develop and act separately. In this direction, following section will deepen potential framework to define integrated actions towards equitable and inclusive mobility.

3.1 UniGe strategies concerning mobility and equality

Following the strategic input of UniGe PAP, potential synergies among gender equality-led planning and university mobility management should be addressed in order to define an integrated approach promoting universal and equitable accessibility that could be methodologically extended from university community to wider urban environments.

It is therefore interesting to deepen whether and which shared goals and initiatives may be coupled between the two sectorial operational tools: UniGe Home-University Commuting Plan and Gender Equality Plan.

UniGe Home-University Commuting Plan[3] was elaborated according to National Guidelines that define basic structure and contents that companies' and administrations' Commuting Plans (Italian Ministry for Ecological Transition, 2021) need to provide.

In particular, following an initial analysis of workers and students mobility patterns, eight lines of actions were identified, that may be clustered into five thematic groups:

1. Public Transport and Sharing Services incentives;
2. University bike lanes network implementation;
3. Sustainable Erasmus students' mobility guide;
4. Communication and dissemination on sustainable mobility choices;
5. People with mobility impairments-dedicated supporting measures.

In details, last group of actions develops into two initiatives:

- DRT for people with mobility-impairments, being them students or workers;
- "Pink parking network" to support pregnant workers that may meet mobility impairments to reach University facilities.

On the other hand, looking at UniGe GEP and relative goals:

1. Data collection, context analysis, monitoring system definition;
2. Work-life balance;
3. Gender balance;
4. Gender equality in career access and advancements;
5. Gender-related research promotion and mainstreaming into UniGe courses;

[2] Available online at: https://cpo.unige.it/pap
[3] Available online at: https://unige.it/en/news/16578-home-university-travel-plan

6. Fight against gender violence and harassment.

It must be noted that mobility-related measures are not present, even though significant benefits in terms of accessibility and work-life balance could be addressed through similar measures, thus enforcing GEP present lines of action.

Despite some contact points, further integrations hence need to be deepened.

4. Integrated accessibility framework definition

Addressing universal accessibility both for students and workers within UniGe community is a significant challenge that needs to be faced now that the present Home-University Commuting Plan is undergoing its updating and revision process. In this direction, starting from the compulsory plan structure provided by Italian Ministry Guidelines on Mobility Management, an integrated framework was developed to include equality and inclusion-dedicated measures addressing universal accessibility. Similar approach would therefore enforce the holistic strategy supported by SUMPs and MM legislation ideally integrated through data collection and processing on mobility routes, pattern and actions. This two-way relation, where strategies are implemented through MM initiatives, that in their turn provide data feeding mobility policies update, could be therefore implemented at University scale, too. The presence of targeted mobility initiatives within HUCP, may constitute indeed the starting point to support a tailored look on University MM, thus supporting inclusive mobility measures implementation but providing as well new data and indicators to shape new policies targeting inequalities' mitigation.

In detail, pre-defined layout includes three main sections:

a) analytical framework: referring to UniGe HUCP, first part is currently developed into four sections: 1. Administration structural asset; 2. Local transport supply; 3. Mobility patterns analysis; 4. Modal shift propensity.

   Significant improvements may come from the inclusion of disaggregated data concerning gender structure of UniGe community, as well as regarding people with mobility-impairments.

   Similar data may be mainstreamed from GEP elaborations as well as UniGe Risk Assessment Document concerning age structure and people with disabilities. In this direction, dedicated actions may address specific groups' needs to increase sustainable accessibility, according to present modal choices and mobility patterns. This data-driven process could therefore use GEP analysis and elaborations as inputs to support user-centred mobility actions design (Fig.2).

b) project actions: moreover, as far as the project section is concerned, it must be noted that the targeted-users measures (DRT for people with mobility impairments and "Pink parking network" for pregnant workers) were identified during the stakeholders' involvement steps when similar instances emerged spontaneously, so that a comprehensive look on universal accessibility and inclusion is missing.

   Despite the extreme relevance of similar bottom-up insights, a more systematic approach towards these issues may lead to the identification of specific and targeted actions, also following best-practices implemented elsewhere and effectively supporting inclusion and equality. In this direction, disaggregated data analysis and processing is therefore necessary to guide an effective user-centred actions design process. This may contribute to overcome potential criticalities connected to under-representation or power-inequalities related to some categories that may meet more difficulties in expressing their specific needs.

c) monitoring indicators: finally, dedicated indicators may be defined in order to enable more comprehensive evaluation of the improvements in terms of universal accessibility. Data disaggregation should therefore guide also the definition of target-oriented indicators-set, so that effectiveness of the action may be assessed separately for each group constituting UniGe community.

At the same time, similar indicators (as well as dedicated measures) may feed in its turn GEP process and tool, so that effectiveness in terms of gender balance may foster also the definition of additional actions to support higher levels of inclusion and equality within educational and administrative UniGe structure, thus fostering a positive and iterative cycle.

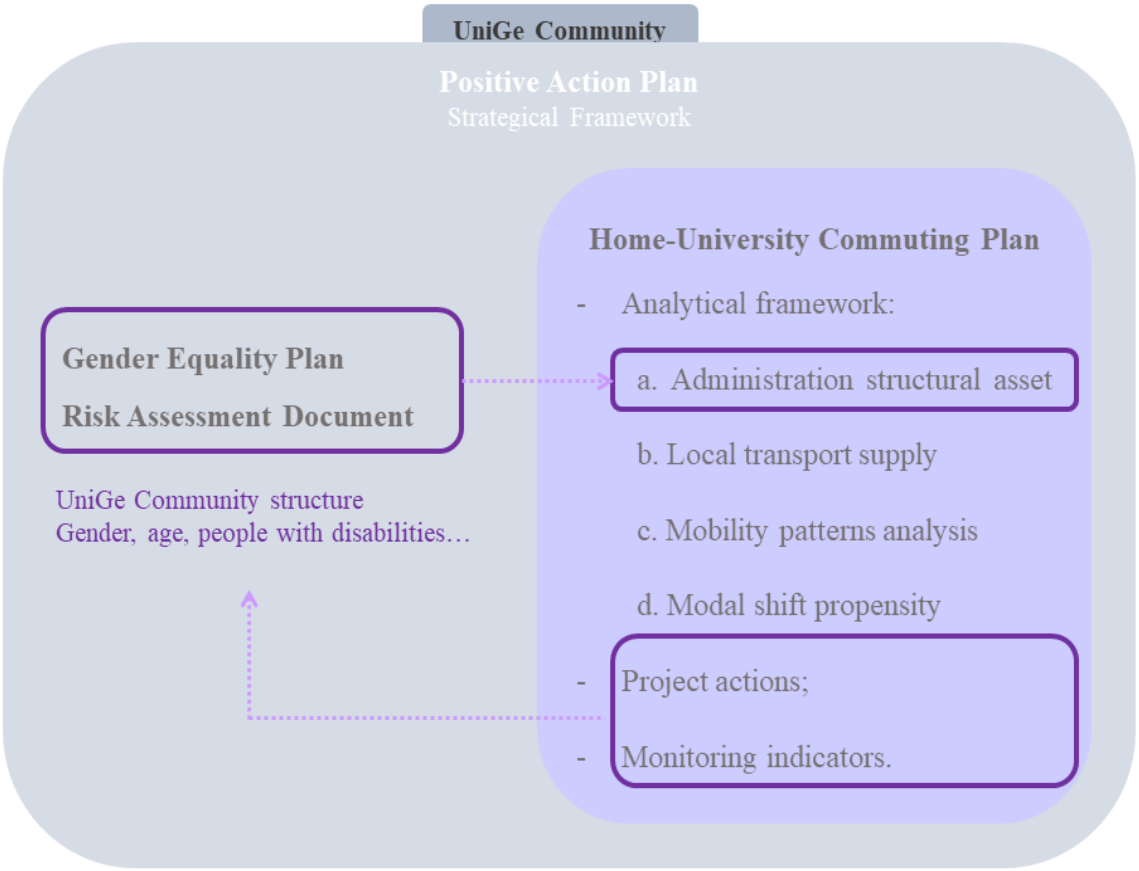

Fig.2 UniGe integrated accessibility framework

Similar disaggregated data collection processes may also enable experimental pilots implementation in terms of user-centred services. In details, University communities may constitute for instance particularly fitting test-beds for MaaS-related experiences, to assess local potential impacts of similar mobility innovations within territorial context.

The availability of disaggregated data regarding University community to be investigated, processed and monitored may indeed constitute a significantly favorable condition to assess local community preparedness and willingness to innovative solutions, that could guide later up-scaling processes to relative urban framework. To this aim, some further considerations on data collection and processing need to be developed.

In addition to the mainstreaming of data coming from other planning tools, specific focus on UniGe Community structure should come indeed from mobility-related survey that need to be developed as preliminary step for HUCP definition. This may help to profile different mobility patterns and behavior according to individual characteristics, as well as to highlight related inequalities.

According to National discipline on mobility management (2021), University Mobility Manager (MM) should be able to collect both general and specific data on community structure, features and mobility in order to build a coherent and holistic knowledge background, supporting decision making process. Similar work should also developed together with Municipal MM (Mobility manager d'area).

It must be noted that, on an operational basis, several barriers concerning students and workers privacy, as well as limited resources dedicated to this aim, may hamper MM potential to deploy a fully integrated and consistent action.

In this direction, to overcome privacy-related issues, as well as to improve the effectiveness of the actions, especially when targeting specific users' groups, that may be disadvantaged by their limited quantitative weight - and consequent reduced representativeness within the general dataset- an interesting approach could be to define several personas (Di Ciommo et al., 2023) among university community, to point out particular needs and develop tailored solutions.

Accessibility indicators may be identified following the same approach, to highlight and trace users clusters' mobility improvements and up-grades. Modal-shift indicators, as well as users' satisfaction and willingness-to-pay are just some of the investigated issues that may help University MM to identify main criticalities and opportunities. The increased autonomy of some users' segments shifting from private cars (dedicated question concern its use as passengers or drivers), as well as the perception of a more seamless and comfort travel experience, hence the propensity to value it more, could constitute interesting reference parameters. In this direction, the reference to some selected personas may contribute to shape effective actions, thus benefitting from monitoring processes.

5. Urban up-scaling potential

It is therefore evident how similar considerations could be interestingly extended from University community to wider urban contexts. Going beyond UniGe community boundaries, similar integrated framework may also pave the way for parallel initiatives on the municipal level.

Universal accessibility represents indeed one of the main aspects in terms of urban quality and welfare for citizens (Biazzo et al., 2019) and cities are currently facing the need to foster it, not only in the name of sustainable development (Weiss et al., 2018), but also of solid pragmatism within Western shrinking cities, where people over-65 are becoming a wide majority of local population (Burlando & Cusano, 2018), Genoa above all (ISTAT, 2020).

In this direction, sustainable mobility planning need to mainstream also considerations and targeted actions addressing gender balance and social inclusion (Fol & Gallez, 2014).

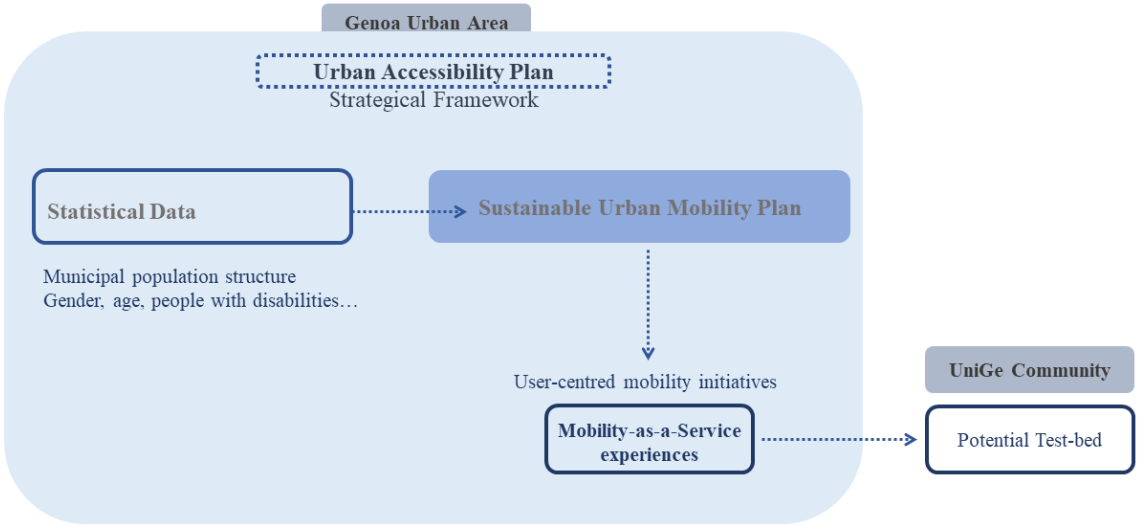

Fig.3 Potential applications to Genoese urban context

Moreover, it must be remembered that National Decree on Mobility Management in 2021 provided also specific provision for Municipal Mobility Manager in terms of collecting data from companies and administrations

Commuting Plans as well as coordinating and addressing individual initiatives within the more comprehensive framework of municipal sustainable mobility strategy. In this direction, the integrated and equality-led approach implemented within university community may foster the up-scaling of this approach on a urban and territorial level.

Similar transfer may be supported not only due to MM shared policies, but also because of the specifical structure of planning framework and tools at municipal level. Being main statistical data (concerning demographic, as well as territorial and socio-economic local features) gathered on that scale, and due to the municipal belonging of competencies concerning operational and executive planning, according to subsidiarity principle, it could be crucially strategic to support present approach up-scaling.

To this aim, in parallel with the methodology implemented by UniGe, following workflow may involve urban and territorial planning tools (Fig.3).

Urban Accessibility Plan by Genoa Municipality may constitute indeed the strategical framework addressing main criticalities to be faced and pivotal goals towards universal accessibility. Together with disaggregated statistical data, it may enhance Sustainable Urban Mobility Plan mainstreaming of specific measures targeting inclusiveness and inequalities reduction, through user-centered mobility initiatives both benefitting from and providing further disaggregated data, thus feeding a virtuous cycle. In this direction, university community may represent not only the driver, but also the final test-bed to experiment innovative mobility actions.

Referring to Genoese context, in details, territorial planning framework provides both favorable factors and barriers.

Significant opportunities may be represented by:

- Metropolitan Sustainable Urban Mobility Plan is indeed currently under monitoring step, so that potential integration concerning universal accessibility may be suggested;
- disaggregated data concerning population structure in age, gender and vulnerabilities may be easily mainstreamed from national and local statistical datasets;
- urban user-centered mobility initiatives may directly benefit from university-led experiences. Choosing University community as a test-bed for strongly data-driven pilots (MaaS applications, above all) may provide deep knowledge of target-users behaviors and choices that may later be transferred to wider urban contexts.

At the same time, it must be noted that:

- Urban Accessibility Plan has never been implemented by Genoese Municipality, so that knowledge background and dedicated actions should be built without previous experiences to be capitalized. Differently from UniGe case-study strategical framework is therefore missing;
- urban mobility disaggregated patterns may be difficultly traced on a urban level. Despite the great availability of data (Manfredini et al., 2023), their processing and use on a large scale, may represent a quite critical challenge, since the up-scaling from university community to territorial contexts implies multiple factors and stakeholders involved thus complicating collection and analysis steps, thus resulting in several privacy protection-related threats, as well.

6. Conclusions

Present research aims at highlighting potential insights in terms of integrated approach towards urban mobility and accessibility through the adoption of user-centered paradigm.

In this direction, the availability of a committed and proactive local University community enables to provide innovative experiences and strategies to be later up-scaled to surrounding wider context.

This initial step should indeed enable to define methodological framework to mainstream gender as well as universal accessibility-related considerations into mobility management policies.

Standardized, one-fits-all approach both in the data collection phase and during actions design process, still prevail according to National Ministry Guidelines, even though academic research highlights significant differences in mobility patterns.

In this direction, gender balance, as well as inclusion and diversity planning goals need to be pursued also through the definition of dedicated actions targeting universal accessibility.

The affirmation of similar mindset and look on integrated planning could represent also a favorable milieu for the implementation of user-centered mobility innovative services (University MaaS, above all) that could pave the way for a more careful and custom approach to transports and inclusion, also on a urban level.

Even though it should be highlighted that university community may often act as forerunner, thus anticipating wider urban one on innovative approaches and practices, due to higher level of education, consciousness and sensibility, the implementation of a local best-case, may prove surprisingly relevant on terms of dissemination and potential for up-scaling.

In this direction, a first significant step was conducted in terms of MM by the University of Genoa. The new survey on mobility patterns of the local community -requested by the HUCP update process, currently ongoing- was developed through an initial part aiming at profiling respondents, in a fully compliant way to privacy protection legislation, in order to provide disaggregated data and tailored user-centered mobility actions aimed at increasing universal mobility and access both for students and workers. MM strategies will therefore benefit from the collection and management of data concerning modal choices, mobility patterns, vehicles availability, willingness-to-change and -to-pay, satisfaction and perceived barriers clustered according to age, gender, place of residence, individual conditions and work position, among others factors. Similar results' processing and joint analysis by UniGe MM and Equality, Diversity and Inclusion (EDI) structures may support indeed an holistic, integrated and intersectional approach to universal accessibility.

At the same time, Genoa Municipality and its MM structure was involved in the process to foster best-practices' transfer and up-scaling.

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Image Sources

Fig.1: UniGe;

Fig.2: UniGe integrated accessibility framework;

Fig.3: Potential applications to Genoese urban context.

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