



SmartUrbanity

User Insights and Design Recommendations

Deliverable 2.4

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Contents

1	2
1.1	2
1.2	3
1.3	4
2	8
1.	9
1.1.	9
1.2.	13
1.3.	13
2.	14
2.1	14
2.2	15
2.3	17
3	18
3.1	18
3.2	21
3.3	23
3.4.	Identification of Personas for the Usability Testing 36
3.4	46
3.5	52
4.	53
4.1	53
4.2	56

4.3	57
5	58
5.1.	58
5.2.	59
5.3.	61
5.4. Next Steps	62
References.....	65
Appendix A: Usability Testing Questionnaire	67
Appendix B: Workshop findings	70

List of Figures

Figure 1: Phases of the adopted mixed-methds approach	14
Figure 2: Results of the questionnaire: Perceptions on the usability of the mobile application (Questions 1 to 7)	15
Figure 3: Results of the questionnaire: Perceptions on the usability of the mobile application (Questions 7 to 13)	16
Figure 4: Steps of the thematic analysis	17
Figure 5: Process for identification of the relevant literature	18
Figure 6: Factors affecting users' mobility solutions preferences	20
Figure 7: Requirements across regional workshops (Access Together)	38
Figure 8: Requirements across regional workshops (Accessibility Analysis Platform)	43
Figure 9: Requirements across regional workshops (Decision Support System)	48

List of Tables

Table 1: Analysis frameworks for regional workshops	17
Table 2: Search terms used in the literature review	20
Table 3: Baseline requirements for the digital tools prototypes	21
Table 4: Regional workshop descriptions	23
Table 5: Public Transport-Dependent Commuter	42
Table 6: Active Local Traveler	44
Table 7: Cost-Conscious Active Cyclist	45
Table 8: Car-Oriented Long-Distance Traveler	47
Table 9: Car-Dependent Long-Distance Commuter	48
Table 10: Usability testing plan for Access Together	50
Table 11: Usability testing plan for Access Atlas tool	52
Table 12: Usability testing for Access Hub tool	53
Table 13: Usability testing plan for decision support system	55

2 Executive Summary

Deliverable D2.4 titled “User Insights and Design Recommendations” aims to explore existing gaps in citizen-centred digital mobility solutions and available accessibility analysis tools. It also aims to identify the factors influencing walking and cycling activities, as well as traveller preferences and satisfaction (T2.5), to define the dimensions investigated during workshops.

Additionally, the deliverable analyses user insights regarding the SmartUrbanity digital tools (Access Together, the Accessibility Analysis Platform and the Decision Support System) derived from regional workshops conducted across five pilot cities during the task T2.2. Furthermore, it presents the identified persona, outlines the methodology for formal usability testing, and provides initial recommendations for the features and design of user-centred digital tools.



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1. Introduction

1.1. Background

The adoption of modern transport solutions such as digital tools and shared mobility applications is primarily driven by public interest and acceptance, which in turn reshapes urban mobility patterns. Traditionally, these systems have been organised as fragmented services rather than integrated citizen-centred models designed for seamless travel. Recent technological breakthroughs in real-time data and smart applications have transformed this landscape by enabling users to move effortlessly between different transport modes, including public transit, cycling and ride-hailing. Consequently, these innovations facilitate more flexible and sustainable travel while creating opportunities for more robust and inclusive Urban Mobility Systems (UMSs).

As UMSs become increasingly complex, incorporating a wide range of interconnected products, services and stakeholders [1], their design requires a framework capable of managing such intricacy [2]. An efficient framework must identify travel challenges from the user's perspective and ensure inclusivity across all population groups.

A deep understanding of user preferences, needs, and limitations is fundamental to modern mobility planning [3]. Systems that are not user-centralised risk higher operational costs and reduced service quality [4]. Consequently, participatory design research, which involves collaborating with users from the initial needs assessment through to final testing, is a vital method for developing universally accessible services [5].

Addressing specific user requirements and potential barriers, the user-centred approach provides several key benefits:

- It identifies gaps and requirements for diverse user groups;
- It ensures services are inclusive, preventing the exclusion of vulnerable populations;
- It enables policymakers and operators to make informed decisions and design more effective services;
- It allows authorities to better anticipate future mobility patterns;
- It significantly increases the likelihood that the public will accept and adopt new solutions.

The 15-minute city concept describes urban environments where all residents can reach essential services and amenities within a set timeframe [7]. This framework addresses modern urban challenges by fostering more liveable, equitable and



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sustainable cities. Achieving a successful 15-minute city for diverse populations requires a deep understanding of varied user preferences and the creation of safe, comfortable mobility environments. Because success hinges on providing accessible spaces that align with the daily needs and behaviours of different resident groups, planners must account for factors such as user profiles, infrastructure quality and environmental safety.

The SmartUrbanity project promotes the cooperation between citizens and policymakers to collaboratively reshape urban landscapes. It provides a digital toolkit intended to improve urban planning and accessibility through three digital components:

1) Citizen Engagement Mobile App: Access Together

A mobile application designed to engage citizens in urban mobility analysis through travel behaviour surveys and daily trip tracking. It allows users to record their journeys and provide feedback on trip purpose, perceived safety, accessibility, and emotional experience, generating valuable evidence on everyday mobility patterns. The app supports pre-trip and post-trip survey logic and contributes to a more user-centred understanding of accessibility and travel behaviour. It also includes a gamification system based on points, badges, and rewards to encourage participation, continuity in data collection, and more sustainable travel choices.

2) Accessibility Analysis Platform: Access Lab

Access Hub:

Access hub complements the mobile application by enabling map-based, deliberative, and collective user contributions. It allows users to report spatial perceptions, identify accessibility barriers, and contribute to the mapping and validation of points of interest and interventions. The platform supports participatory processes such as commenting, verification, and voting, which enhance the reliability and traceability of user-generated data. By aggregating validation signals, Access Lab contributes to quality assurance mechanisms within the modelling framework. It thus serves as a bridge between individual experiences and collective knowledge, supporting governance workflows and participatory planning.

Access Atlas

The access atlas platform is an accessibility analysis tool designed to assess how easily people can reach essential urban services such as healthcare, education, mobility, leisure, and daily needs. It combines geographic data, transport networks, service locations, and urban zones to provide a realistic picture of accessibility across the city. The platform allows users to analyze accessibility not only by location, but



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also by different mobility conditions and user characteristics, making the results more socially inclusive and relevant. Through interactive maps and visual dashboards, it shows how services are distributed and which areas have better or worse access. This helps identify underserved neighborhoods and supports better planning decisions for more equitable and efficient cities. Overall, the platform serves as a practical tool for understanding and improving urban accessibility within the framework of 15-minute city and inclusive planning strategies.

3) Decision Support System

An advanced platform designed to support policymakers in assessing and comparing urban mobility interventions. It helps decision-makers monitor infrastructure, analyse mobility patterns, and evaluate interventions based on costs, urgency, projected outcomes, and impacts on disadvantaged groups.

This toolkit includes tools for data collection and analysis to ensure that urban planning is both sustainable and inclusive. Also, these digital platforms aim to empower residents by providing them with a direct voice in planning decisions.

To understand the user's preferences, we first identified user needs and preferences through a comprehensive literature review focusing on public transport, shared mobility and active travel modes. While this literature review highlighted numerous dimensions that influence user preferences, addressing every possible factor within a single project is not feasible. Consequently, a targeted set of factors was selected to align with the project's objectives and the 15-minute city framework. In a second step, a set of workshops has been organised in each pilot region (e.g., Lyon, Izmir, Karlsruhe, Rome, Thurgau) where citizens were invited to express their opinions about the current version of the digital tools. This approach ensures that the resulting digital tools are built upon the most relevant user-centric insights that serve the goals of the 15-minute city.

To identify the gaps in the existing citizens engagement application, focusing on the assessment of cycling and walking activities. Six applications focused on walkability have been studied. From the studied applications, the following gaps have been identified:

- Focus on reliability over user experience: Research comparing smartphone and web-based audits often focuses on the reliability of data rather than the utility, usefulness, or user-friendliness of the tools [8].
- Neglect of vulnerable groups: Multiple studies fail to explicitly consider the needs of vulnerable groups or include features specific to their requirements, especially from the design phase [9] [10].



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- Limited accessibility assessment: Even applications that evaluate route quality for pedestrians may not explicitly aim to assess accessibility [11].
- Bias toward negative assets: Certain crowdsourcing tools focus exclusively on limited and negative assets, like obstacles and surface problems, while ignoring positive assets such as benches and shaded areas [11].
- Poor engagement and design: There is a noted need for better user experience design and gamification mechanisms to improve overall user experience and better engage citizen volunteers.

For user-centred applications designed for the assessment of cycling activities, most of the studies relied on embedded sensors or smartphone data as an alternative [12] [13], since collecting subjective feedback from citizens during a journey is difficult due to safety concerns. Embedded sensors could provide useful objective feedback, while subjective feedback via questionnaires frequently suffers from bias and conflicting results. Other studies used professional static audits; however, professional onsite audits, while reliable, cannot be conducted frequently and fail to adjust to the dynamic nature of physical urban environments [14]. Finally, the exploitation of existing applications providing urban data (such as Google Street View) does not include micro environmental data. Collecting these microenvironmental data often requires additional on-site assessments to accurately capture the specific microenvironment of cycling.

Existing accessibility tools [15, 16, 17] have been developed to support the analysis of spatial accessibility and inform transport and urban planning decisions. Typically, these tools combine geospatial data with transport network information to evaluate how easily people can reach key destinations, such as services, educational facilities, or healthcare providers, within a given time threshold. Many platforms provide heatmaps, isochrone analyses, and indicators of travel time or distance across different transport modes. They often also provide detailed information about the amenities available. Additionally, some tools enable users to explore accessibility patterns for specific population groups or transport scenarios, thereby supporting the evaluation and planning of mobility interventions based on evidence.

Despite these advances, important gaps remain in existing accessibility tools. Many platforms primarily rely on objective indicators such as travel time and distance. In contrast, factors related to perceived accessibility - such as comfort, quality of stay, infrastructure quality, and safety (e.g., road safety or street lighting) - are often insufficiently represented. Similarly, the integration of barrier-free accessibility remains limited, particularly for diverse mobility impairments and temporary mobility restrictions. While some tools provide maps of barrier-free infrastructure, such as accessible routes, destinations, ramps, or barrier-free toilets, these representations are often incomplete. As a result, they do not fully capture the diverse accessibility requirements of different user groups.



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Existing tools also rarely account for heterogeneous mobility behaviours, such as different walking speeds, individual restrictions, or user personas reflecting varying mobility needs. In addition, they typically do not allow users to apply individual weightings to different types of destinations based on personal preferences or priorities. Contextual factors influencing accessibility are also frequently overlooked, including weather and climate conditions, heat islands, or the availability of shading along routes. Infrastructure-related aspects that may affect mobility choices - such as the suitability of cycling infrastructure for cargo bikes, the availability of e-bike charging facilities, or bicycle parking options - are also rarely incorporated. Moreover, accessibility analyses are often static and do not account for time of day, even though travel conditions, safety perceptions, and infrastructure usability may vary significantly across the day. Furthermore, accessibility assessments frequently focus on general service destinations and transport infrastructure, while aspects such as access to employment opportunities are not always explicitly incorporated. These limitations highlight the need for more inclusive, context-sensitive accessibility analysis tools that better reflect the diverse mobility conditions of urban residents.

1.2. Objectives

The main objectives of this deliverable are:

- **Objective 1:** Based on the literature review, identify the dimensions of factors influencing the travellers' preferences and satisfaction in urban mobility solutions.
- **Objective 2:** Define a set of selected factors that will be addressed in the initial design of digital solutions.
- **Objective 3:** Understand user insights about digital solutions via a set of regional workshops.
- **Objective 4:** Derive recommendations for features and design of the presented digital solutions.

1.3. Document Structure

This deliverable is structured to provide a comprehensive overview of the user-centred design used in the SmartUrbanity project. Starting with an introduction that establishes the background of user-centred urban mobility and the primary objectives of the project. Afterwards, it details a threefold methodology focused on identifying traveller preferences through literature reviews and regional workshops. To ensure correct inclusiveness for future usability testing of the developed digital tools. These insights are further illustrated through the development of diverse user personas.



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Following the methodology, the report presents results and findings of both the literature review and the workshops.

The document then transitions into a discussion regarding the implications and limitations of the research. Finally, it concludes with targeted design recommendations for the initiative's three primary digital solutions.

2. Methodology

2.1 Research Approach

Although covering all potential variables is not feasible, the research prioritises a targeted set of factors that directly support its core objectives.

This approach first involves examining the preferences and lived experiences of citizens and vulnerable populations to ensure that all recommendations are based on user-centric insights. In the next phase, citizens participate in the design of mobility solutions through five workshops where the digital solutions are presented to the citizens and policymakers. These regional workshops are designed to identify the specific mobility challenges and barriers citizens encounter in their daily travels. Furthermore, they serve to evaluate whether the current design of the project's digital solutions aligns with actual user requirements and to determine how these tools can provide meaningful utility for diverse resident groups. The outcome of the workshops was a set of initial recommendations for all the digital tools. In a third step, usability testing will be conducted with a number of participants to assess the usability of the digital tools and identify the difficulties faced by the users. The profiles of the participants are derived from the personas. This usability testing will be conducted in the next work package (WP3). These tests will provide a quantitative and qualitative assessment of the tools. In the last step, using qualitative and quantitative measures, final recommendations will be derived and communicated to the tools' development team.

The used method mixes both qualitative and quantitative measures. Quantitative approaches are highly effective for identifying operational factors that correlate with service adoption and usage frequency [18]. However, they are less capable of capturing the nuanced experiential factors that drive traveller behaviour, like subjective perceptions, which are fundamental to understanding user preferences and the causes of dissatisfaction. To provide a comprehensive analysis of subjective factors and user experience, here we adopt a mixed-methods approach that integrates both qualitative and quantitative techniques. This synergistic strategy allows for a deeper exploration of nuanced experiential data, such as traveller perceptions and dissatisfaction, which is essential for building recommendations upon genuine user-centric insights [19] [20]. A detailed description of this methodology is presented in Figure 1.



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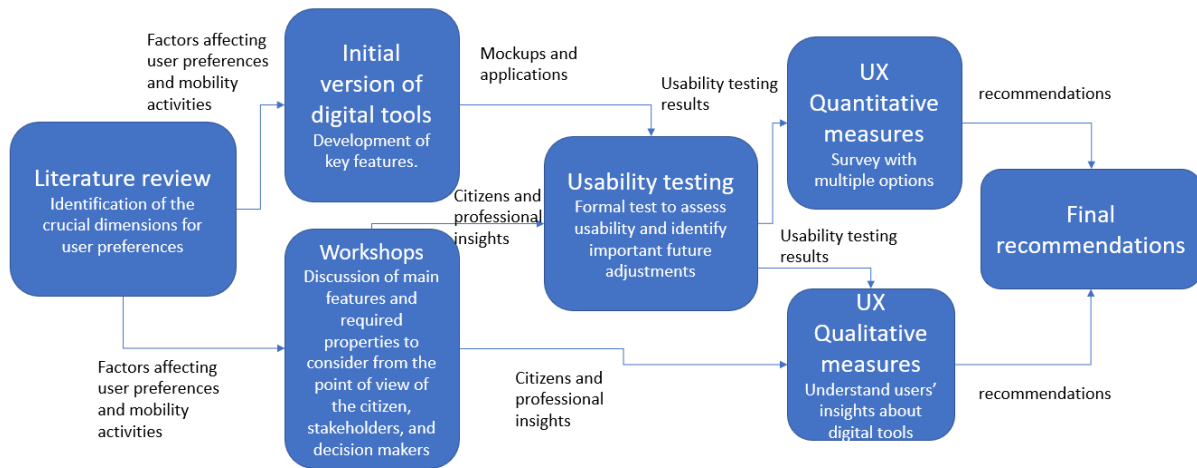


Figure 1: Phases of the adopted mixed-methods approach

2.2 Data Collection

To derive recommendations for digital solutions, a variety of data sources were collected, analysed and synthesised. First, a literature review was conducted to identify factors influencing user preferences and experiences. A second literature review was carried out to examine existing citizen-centred applications for cycling and walking, and accessibility analysis tools. Second survey results and qualitative data from Task T2.2 (participatory framework development and stakeholder engagement) through five regional workshops were used to generate insights into mobility barriers and inform initial recommendations for digital tools. In addition, on 27 October 2026 the tools were presented at academic sessions where a usability questionnaire was distributed to gather initial feedback (Appendix A) regarding usability, ease of use, and the willingness of users to share private information. This survey—comprising 13 structured questions and one open-ended feedback section—indicated a broadly positive reception of the application’s features and design (refer to Figure 2 and Figure 3). The 15 participants were recruited from an academic context (master’s class). The onboarding process was found to be highly accessible, with the majority of users finding account creation and password management tasks to be straightforward. Furthermore, 82% of participants commended the interface for its clear, logical layout, which aligns with workshop recommendations for simple, intuitive design.

The tool also demonstrated high practical relevance to the lives of its users; 73% of respondents confirmed it effectively supported the transport modes they commonly use, while 64% found environmental metrics—such as total CO2 reduction and distance travelled—to be both useful and easy to interpret, fulfilling a specific interest in environmental feedback identified during regional workshops. From a design standpoint, these results suggest that the current visual interface and core navigation systems offer a robust and reliable foundation for the platform's ongoing development. Finally, existing usability testing approaches were reviewed to identify the most suitable methods for evaluating the digital tools.

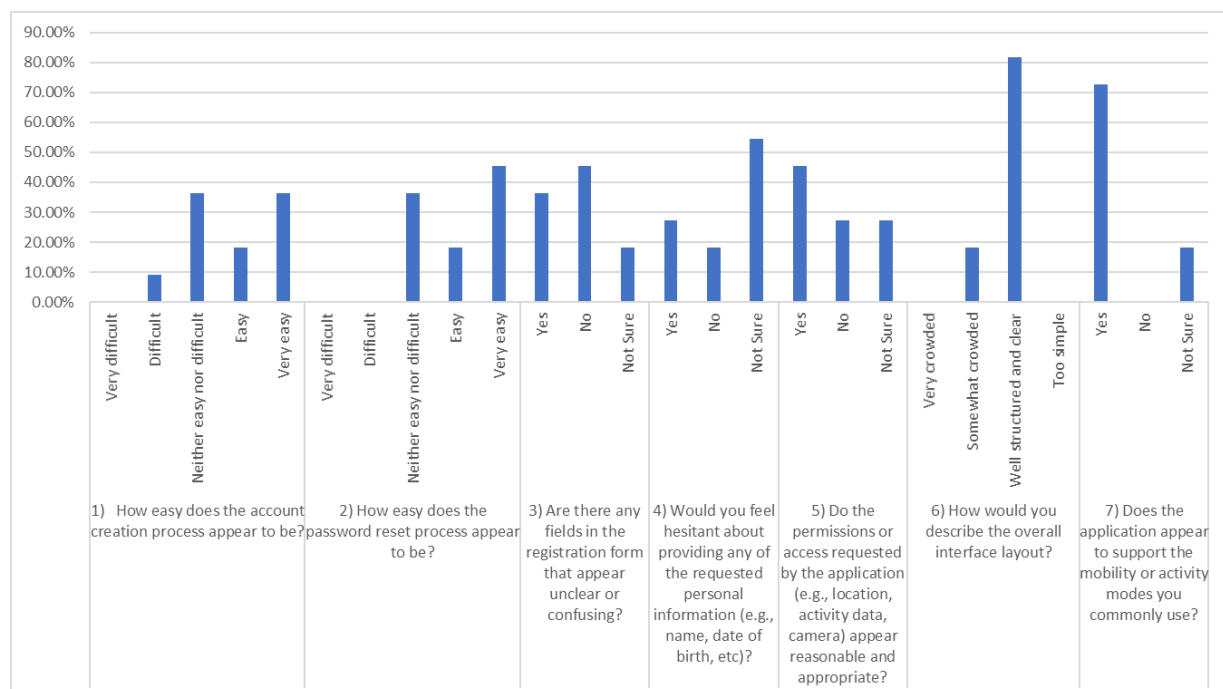


Figure 2: Results of the questionnaire: Perceptions on the usability of the mobile application (Questions 1 to 7)

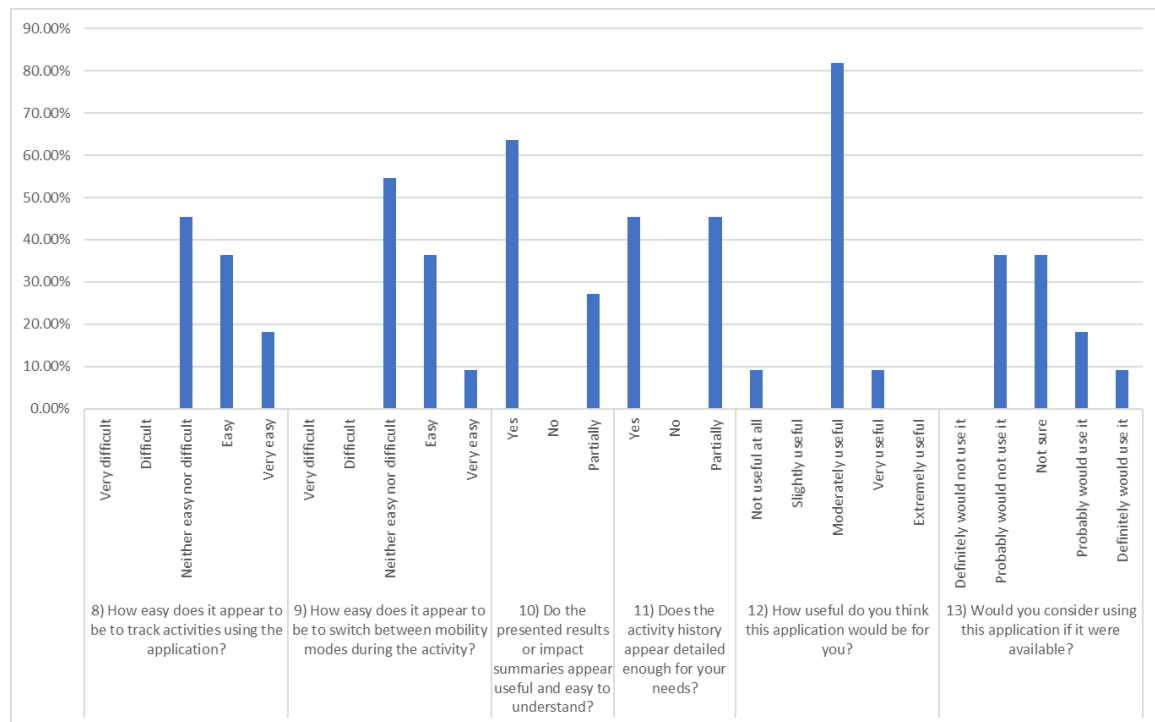


Figure 3: Results of the questionnaire: Perceptions on the usability of the mobile application (Questions 7 to 13)

2.3 Analysis Framework

In this section, the details about the analysis framework used in each workshop will be presented.

Table 1: Analysis frameworks for regional workshops

Workshop	Type	Responsible	Analysis framework
Lyon	online	ENTPE	Thematic analysis
Rome	In-person	Movesion	Thematic analysis
Karlsruhe	In-person	KIT	Thematic analysis
Izmir	Online	EGE	Thematic analysis
Thurgau	Online	ZHAW	Thematic analysis

Each workshop was moderated by two to three researchers, who facilitated engaging discussions and collected valuable insights while ensuring a smooth and inclusive experience for all attendees. Some sessions took place in person while others were conducted online. The online sessions were recorded and transcribed. The transcripts were coded, and the analysis followed the thematic analysis of the main topics discussed. Table 1 gives a summary of the analysis used for the regional workshops.

Thematic analysis is a qualitative research method used to identify, analyse, and interpret patterns and themes within qualitative data [21]. It involves systematically

coding the data and grouping similar ideas to uncover meaningful insights to understand participants' perspectives and highlight key issues across discussions. Figure 4 gives an overview of the applied analysis (NVIVO).



Figure 4: Steps of the thematic analysis

3 Results and Findings: Users' Needs and Preferences

3.1 Literature Overview

User preferences are defined as the individual priorities and choices that dictate which mobility solution a person selects [2]. These solutions encompass a broad spectrum of modes, including public transport (PT), demand-responsive transport (DRT), car sharing, ride-sourcing, micro-mobility, multimodal options, and walking. The rate at which these modes are adopted depends on various socioeconomic and sociodemographic factors, as well as specific trip and urban characteristics [22]. For any given mode, a traveller's preference is shaped by the attributes of the service provided, such as its timing, frequency, cost, and quality. Furthermore, these preferences vary significantly across different mobility solutions and differ between distinct user groups according to their specific needs.

Numerous factors influence user preferences within Urban Mobility Systems UMSs with specific determinants varying significantly by transport mode.

Mobility services characteristic is the first category of factors. This category concerns mainly the public transport and shared-mobility solutions. According to the literature review, service reliability is the most significant factor driving passenger satisfaction in public transport, whereas overcrowding remains the primary cause of user dissatisfaction. While extended travel durations and wait times typically reduce satisfaction levels. The negative impact of waiting can be lessened through the provision of reliable real-time information [23]. Additionally, physical comfort encompassing seat availability, personal space and the opportunity to work during transit substantially influences how travellers perceive their overall journey [20].

User profiles indicate significant variations in how different demographic segments engage with mobility services. Safety is a critical priority for women who report substantially greater concern than men, especially regarding the use of public transport at night. There is also a notable generational divide; younger travellers place a high value on digital tools, punctuality and modern amenities, whereas older users frequently prefer face-to-face interactions and tend to require less navigation

assistance for their routine travel [24]. Additionally, sociodemographic factors, specifically higher levels of income and education, are statistically associated with a greater likelihood of utilising ride-sourcing services [25].

Contextual factors act as external triggers that can override a traveller's usual mode preferences. With weather serving as a primary situational influence, for instance, adverse conditions such as rain frequently prompt pedestrians and cyclists to switch to public transport or carsharing services during the workweek [26]. Furthermore, trip-specific constraints, including carrying heavy luggage, travelling with children or facing strict time pressures, diminish the appeal of active and public transit, often making private or shared vehicles the preferred choice. Finally, external factors like driving restrictions also act as contextual drivers that encourage the adoption of public or shared mobility solutions.

Based on the literature, mobility and urban properties are critical in determining the physical viability of various transport options within a city. For example, for the successful integration of e-scooters and bicycles into the first and last mile of a trip, it is essential to maintain high station density and short distances between transit hubs and shared mobility parking areas. Furthermore, the quality of infrastructure, including dedicated cycling lanes, functional street lighting and well-maintained sidewalks, is directly linked to higher usage rates and improved safety perceptions for active transport. The inclusion of green infrastructure, such as tree shading and proximity to parks, further enhances the comfort and safety of pedestrians and cyclists, offering particular benefits to vulnerable groups.

The conducted literature review was submitted to a scientific conference. Figure 5 present the process of identifying relevant literature.

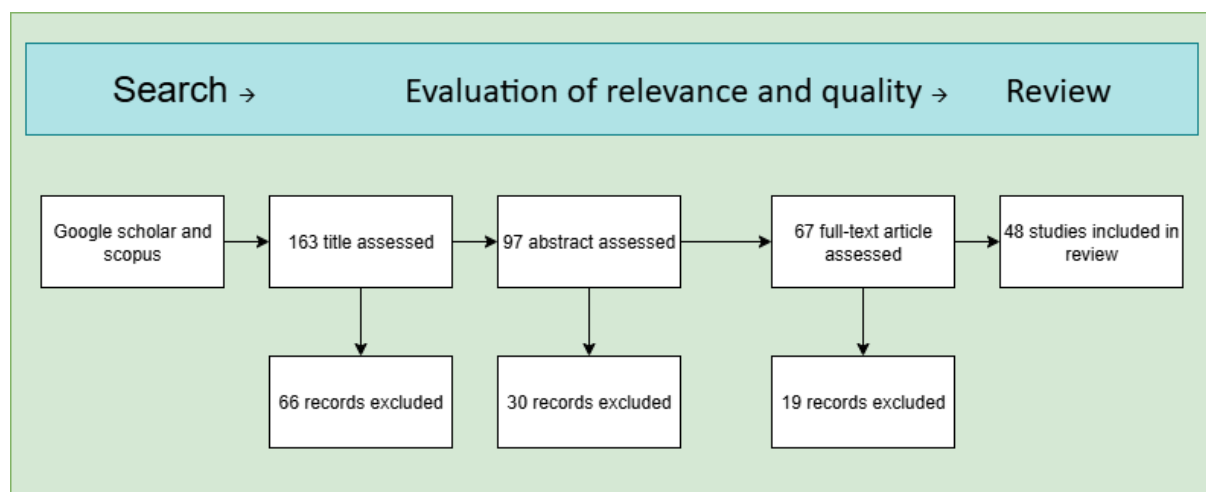


Figure 5: Process for identification of the relevant literature

The aim of the literature review is not only to explore the factors that may affect user preferences toward mobility solutions but also the applied methods to derive these preferences. However, in this report, we are only interested in presenting the factors. The databases used are Scopus and Google Scholar. Table 2 presents the search terms used. We focused on the studies between 2015 and 2026. In the first screening process, studies were filtered based on their titles. In the second step, after the assessment of the abstract, research works that do not determine specific factors as determinants that affect user mobility preferences were excluded. However, this was not clear from the abstract in all the research works. The same criteria were used to filter the studies in the third step.

Table 2: Search terms used in the literature review

Theme	Keywords
Inclusiveness	Elderly, mobility equity, inclusion, accessibility
Factors affecting user preferences	user preferences, mobility preferences, stated preference, user-centred transport, revealed preference, weather, trip purpose, waiting time, travel time cost, built environment, safety, convenience, infrastructure, accessibility, service quality, green spaces, environmental characteristics
Shared Active Mobility	Bike sharing, shared e-scooters, walkability, active travel
Public transport	Public transport, bus, transit, train
Car sharing	car sharing, ride sourcing

While a literature review identified six primary dimensions of user preferences (Figure 6), this work package (WP2) focuses specifically on the four dimensions most relevant to the project's objectives: user profile, user experience, contextual properties, and mobility and urban properties.

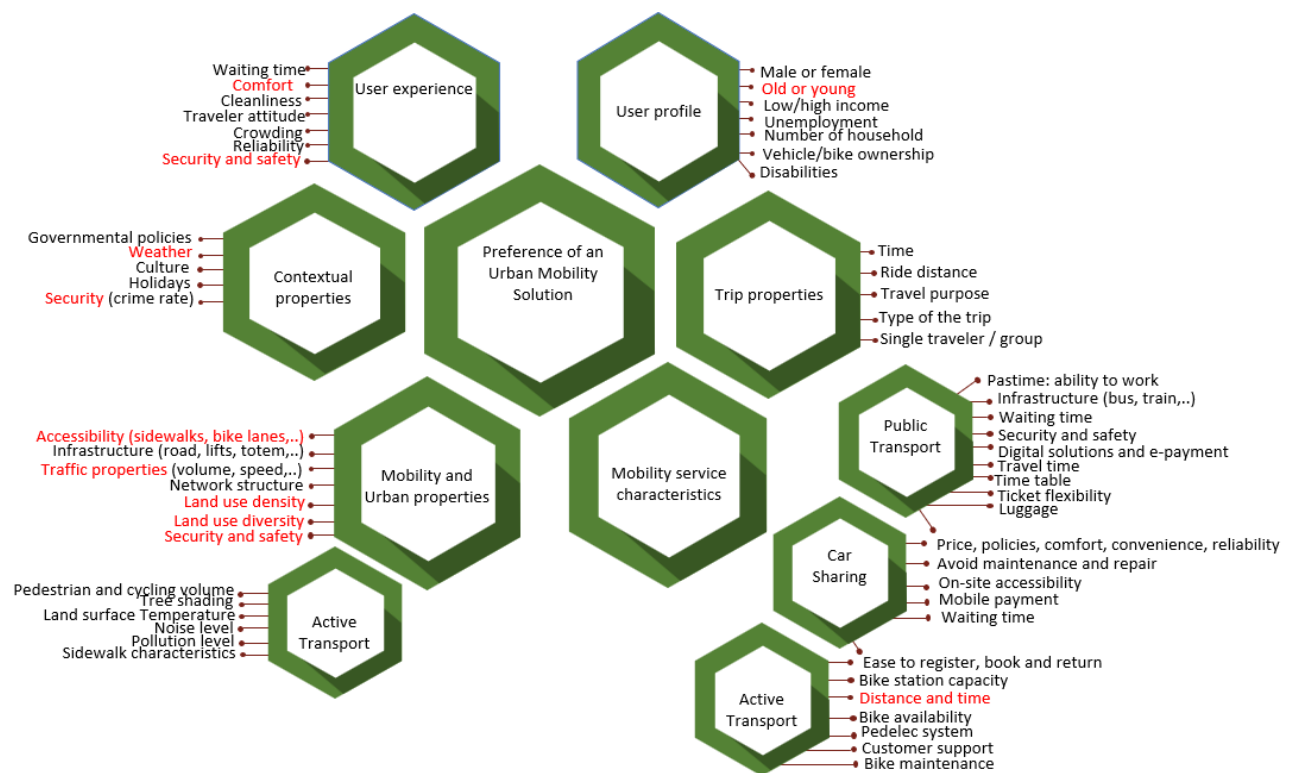


Figure 6: Factors affecting users' mobility solutions preferences

Successfully attracting diverse communities to these services requires a comprehensive investigation into both objective and subjective user opinions. This is best achieved through a user-centred approach that involves citizens in the initial design phases and maintains a continuous analysis of their feedback. By understanding the relative importance of these various dimensions, policymakers and planners can more effectively refine regulations and design transport options that genuinely meet the daily needs and behaviours of all residents.

3.2 Baseline requirements

In this section, we provide baseline requirements for the digital tools prototypes. These are considered primarily/general requirements for providing easy-to-use digital solutions without focusing on feature-specific requirements. Additional requirements derived from the workshop findings will be presented in the next section.

Table 3: Baseline requirements for the digital tools prototypes

Requirement	Description	Application
Text resizing and display scaling	Text should support system-level resizing and display scaling without loss of functionality. Increasing font size should	Access Together

	not cause content overlap, hidden information or inaccessible controls.	• Access Atlas • Access Hub • DSS
Accessible form labels and inputs	All forms search fields, filters, and data-entry components should have clear labels, instructions and error messages. Placeholder text should not be used as the only form label.	• Access Together • Access Atlas • Access Hub • DSS
Color and contrast	Information should not rely only on color differences. Sufficient contrast should be maintained between text, icons, buttons, and backgrounds	• Access Together • Access Atlas • Access Hub • DSS
Easy Navigation	Provide simple navigation, readable text, clear instructions, larger interaction areas, and reduced complexity.	• Access Together • Access Atlas • Access Hub • DSS
Non-native language users	Provide clear language translation options where relevant and avoid culturally specific assumptions or complex expressions.	• Access Together • Access Atlas • Access Hub • DSS
Clear navigation structure	The application should provide consistent navigation patterns, predictable layouts,	• Access Together

	and clear indication of the user's current location within the app	• Access Atlas • Access Hub • DSS
Feedback and system status visibility	Users should receive clear feedback after actions. The system/application should communicate what is happening and what the user can do next.	• Access Together • Access Atlas • Access Hub • DSS
Privacy and trust	Data collection, particularly tracking data, should be transparent. Users should understand what information is collected and how it is used.	• Access Together
Users with low digital literacy levels	Use consistent layouts, simple terminology, clear instructions and avoid overwhelming users with too many options at once.	• Access Together

3.3 Insights from Regional Workshops

Between January and March 2026, five regional workshops were conducted across the project's pilot locations, Rome, Karlsruhe, Izmir, Lyon and Thurgau. These sessions brought together a diverse group of stakeholders, including citizens, decision-makers, urban planners and mobility operators, to ensure a transdisciplinary approach to urban challenges.

Table 4: Regional workshop descriptions

Workshop title, language, and Date	Duration and format	Recruitment method and number of participants	demographics
Building the 15 minute city in Lyon 13/02/2026 French	2.5 hours - Online	Convenience recruitment: participants are recruited based on	2 elders, 2 foreigners 2 decisions makers 7 females 6 males

		their availability and accessibility. 12 participants	
Citizen Engagement App 13/01/2026 Italian	2 hours – In person	Convenience recruitment 13 participants	13 citizens
Decision Support System platform and integration 25 February 2026 Italian	2 hours – In person	Convenience recruitment 23 participants	8 citizens 4 decision makers
Digital tools for 15-minutes city 10/02/2026 German	4 hours – In person	Convenience recruitment 13 participants	3 elders. 2 participants from vulnerable group 7 Males 6 Females
Cities with strong interactions 10/02/2026 Turkish	2 hours – In person	Convenience recruitment 15 participants	-
Cities with strong interactions 18/02/2026 Turkish	2.5 hours – in person	Convenience recruitment 30 participants	-
15 Minute city & Sustainable mobility 24/02/2026 German	2 hours - Online	Convenience recruitment 25 participants	-

The primary objectives of these workshops were: First, to identify the specific challenges and barriers residents encounter in their daily mobility. Second, to facilitate a collaborative dialogue between citizens and policymakers to discuss potential urban opportunities and systemic obstacles. Finally, the workshops provided a platform to demonstrate the features of the developed digital tools, such as the Citizen

Engagement App and the Accessibility Analysis Platform, while gathering user insights to refine their design and functionality.

This section presents the primary mobility barriers and pains highlighted by participants during these collaborative sessions. Also, it presents the collected insights about the features of the developed tools and the derived recommendations.

2.3.1. Urban mobility challenges and barriers

The regional workshops identified a diverse array of urban mobility challenges that underscore the complexity of achieving seamless, inclusive transit. In Rome, participants highlighted a strong dependency on private vehicles, driven by the perception that public transport is infrequent and unreliable, while the pedestrian network is hampered by significant elevation changes and numerous stairways. Despite these hurdles, there is a recognised potential for accessible walking routes to drastically reduce travel times if properly implemented. Residents in Karlsruhe face similar difficulties with physical barriers, such as inaccessible transport stops and buildings, alongside safety concerns regarding poorly lit streets and unsafe crossings. A lack of reliable information about infrastructure quality—ranging from winter maintenance of cycling paths to the availability of e-bike charging stations—further complicates daily navigation.

Issues of accessibility and safety are also paramount in Izmir, where the continuity of barrier-free routes and sidewalk transitions are critical for wheelchair users and parents with strollers. Safety is a particular concern for women and vulnerable groups in Izmir during evening hours, a sentiment echoed in Lyon where users reported security risks in parking areas. Lyon also faces significant operational failures, such as broken lifts at major hubs and inconsistent transport schedules, which directly impede movement. In Thurgau, while suburban infrastructure is generally seen as safe, urban bike lanes are perceived as dangerous due to frequent accidents involving trams. Swiss participants noted that while their cities often function as 15-minute cities, suburban residents still rely on cars due to lower transit density, leading to a rise in on-demand services to bridge the gap to train stations. Ultimately, the success of the 15-minute city model relies on improving proximity, security, and comfort while ensuring that digital interfaces are inclusive of the elderly, low-income individuals, and non-native speakers. These user pains underscore that the success of a 15-minute city depends on proximity, security, comfort, infrastructure, and the minimisation of both travel and waiting times. To address these issues, participants emphasise that the development of user-friendly digital interfaces should also consider the needs of the elderly, low-income individuals, and immigrants by accounting for language diversity. Additionally, gamification strategies must be more clearly defined to engage a broader demographic beyond just younger users. These strategies should explicitly address the specific requirements of vulnerable populations, such as individuals with mobility impairments, wheelchair users and those using baby strollers, to ensure a truly inclusive urban environment.



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3.3.2. Access Together

Insights gathered from the regional workshops indicate that for a mobile application, it must be rooted in transparency and trust. Participants in Rome emphasised that users are more willing to contribute data on everyday mobility and neighbourhood barriers if their input produces visible results, such as traceable feedback via report status tracking and clear visibility of the responsible administrative office. This transforms the application from a mere reporting interface into a meaningful trust-building tool that links citizen engagement directly to administrative follow-up. To encourage ongoing usage, the barriers reporting flow should be short and structured, offering quick submission options and the ability to finalise reports at a later time. In Karlsruhe, participants suggested that including the specific purpose of a trip would improve data quality for further analysis. They also proposed technical enhancements like automatic trip detection via smartwatches and the ability to record trips offline to alleviate the constant requirement for internet connectivity. A structured feedback mechanism that notifies users when reported infrastructure issues are resolved was considered a primary motivator for long-term engagement. Efficiency is further improved when reports are forwarded directly to relevant parties, such as local transit authorities, to reduce the time needed for interventions.

Digital inclusivity was a significant theme across all regions. In Karlsruhe, the need for multilingual support, intuitive design, and battery efficiency was highlighted, alongside accessibility features like screen reader compatibility and voice-input options for visually impaired users. Users in Izmir shared an interest in receiving feedback on the environmental impact of their mobility choices and requested health-related features, such as identifying high air-pollution areas for sensitive individuals. In Lyon, participants noted that the reporting process must be extremely fast—ideally completed within a 5 to 10-second window—to ensure adoption. They also stressed the importance of integrating multimodal transport options and providing clear, comprehensive documentation to improve user engagement. Finally, workshop participants in Thurgau advocated for making the app engaging and fun through gamification, seasonal challenges, and rewards like public transport discounts. While social features and personalized profiles were seen as valuable for community building, they also raised critical data privacy considerations that must be addressed under relevant regulations. (Refer to Annex B Table 2 for a detailed summary of these recommendations).

The following requirements for WP3 follow from the aforementioned recommendations.

- Feedback on reported issues: Users should receive notifications and status updates after submitting a report so they know whether the issue has been



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acknowledged, processed, or resolved. This implies a more useful and reliable application that builds trust through visible administrative follow-up. From stakeholders' opinions, the implementation of such a requirement is possible by providing minimal details on the state of the reported barriers.

- **Transparent issue handling:** The application should clearly indicate which authority is responsible for each report and how reported issues are managed, which improves transparency and provides a clear view of quality control for the user. The implementation of this requirement is not possible since not all the responsible authorities are involved in the project.
- **Quick reporting workflow:** Reporting should require minimal effort, allowing users to submit issues within a few seconds using a streamlined interface. This implies higher adoption and engagement by minimising the time burden on the citizen. The implementation of this requirement is possible.
- **Offline reporting:** Reports should be stored locally when no internet connection is available and automatically synchronised once connectivity is restored. This implies a more accessible system that alleviates the constant requirement for a connection. Although the implementation of this requirement is technically possible, it will not be implemented since it is not documented as part of the current SmartUrbanity implementation.
- **Automatic trip detection:** The application should automatically detect and record trips, reducing the need for manual user input and providing a more convenient user experience. Although the implementation of this requirement is technically possible, it will not be implemented because activity tracking remains consent-based and user-controlled.
- **Trip purpose recording:** Users should be able to specify the purpose of their trips (e.g., commuting, shopping, leisure) to improve mobility analysis. This implies higher quality data for planners to conduct more meaningful mobility analysis. From stakeholders' opinions, the implementation of this requirement is totally possible.
- **Infrastructure quality reporting:** Users should be able to report the quality and condition of transport infrastructure, including accessibility barriers. This helps to make the application more closely aligned with citizens' daily navigation needs. The implementation of this requirement is already in the application.
- **Barrier map visualisation:** Previously reported mobility barriers should be displayed on the map to increase awareness and avoid duplicate reports. This helps to make the application more informative and helps users avoid redundant submissions. The implementation of this requirement is totally possible.
- **Multilingual support:** The interface should support multiple languages to improve accessibility for diverse user groups. This implies a more inclusive platform that aligns with the project's core social requirements. The implementation of this requirement is entirely possible.
- **Accessible interface:** The application should support assistive technologies such as screen readers, voice input, and other accessibility features. This

recommendation helps to have an equitable design that supports visually impaired and younger user groups. Based on developers' and stakeholders' feedback, the implementation of such features is not possible within the timeframe of the development of the digital tools. Future versions may take into consideration this recommendation.

- **Mobility statistics dashboard:** Users should have access to summaries and visualisations of their own mobility patterns and aggregated regional statistics. This implies a more engaging environment that motivates usage through personalised insights. Although the implementation of this requirement is technically possible, developers can consider it in future versions, but not in the first version of the application.
- **Anonymous use:** The application should allow participation without requiring account creation, while making profile information optional. Taking into consideration this requirement, the application will be more flexible and address widespread user concerns regarding data privacy. The implementation of this requirement is partially possible. Some features do not require creating a profile, while registration remains mandatory for other features.
- **Optional user profile:** Users may create a profile to enable additional personalised services without making registration mandatory. This can help to balance between personalised services and user data preferences. The implementation of this requirement is partially possible but can limit advanced personalised features.
- **Personalised recommendations:** The application should provide personalised mobility information based on user preferences, routes, or health conditions. This implies a more useful application that provides specific value to the individual's daily life. The implementation of this requirement is possible.
- **Gamification and rewards:** Incentives such as points, challenges, or rewards should encourage sustained user participation. This provides a more engaging environment that motivates continuous data contributions but requires a clear budget to maintain. The implementation of this requirement is possible.
- **Environmental impact feedback:** Users should receive information about the environmental impact of their mobility choices. This makes the application a more informative tool for health-conscious and environmentally sensitive users. The implementation of this requirement is possible.
- **Comfort/Health-aware routing:** The application should provide recommendations considering health-related factors such as air quality or individual mobility needs, which make the application a more practical and supportive tool for vulnerable populations. The implementation of this requirement is partially possible.
- **Save frequent routes:** Frequently used routes and transport modes should be saved to simplify repeated trips. This implies a more user-friendly interface that simplifies repeated daily trips. The implementation of this requirement is

technically possible but will not be implemented. The tool aims to provide trip evidence for analysis. Including a journey planning feature is not considered one of the objectives of the application.

- Multimodal transport support: The application should integrate different transport modes to support seamless journey recording, which implies a truly inclusive system that gives citizens more realistic transit insights. The implementation of this requirement is entirely possible.
- Clear tutorials: Simple documentation and onboarding tutorials should help users understand the application's functionality. This improves user engagement by ensuring citizens can easily navigate the app. The implementation of this requirement is entirely possible.
- Added value over existing apps: The application should clearly differentiate itself from existing mobility platforms by providing unique features to provide reasons for citizens to install and keep the app. The implementation of this requirement is entirely possible.
- Travel experience reporting: Users should be able to report subjective travel experiences in addition to physical infrastructure barriers. This implies a broader application scope that captures the perceived quality of the mobility experience. The implementation of this requirement is entirely possible.
- Privacy-friendly operation: Core functionalities should remain available without extensive personal data collection or continuous trip tracking, which gives a flexible environment that alleviates concerns about invasive data collection. The implementation of this requirement is possible, but it can limit advanced personalised features.
- Operational efficiency: The application should provide reliable performance, fast response times, and low battery consumption, which can increase its usability. The implementation of this requirement is partially possible.
- Content moderation: Mechanisms should prevent inappropriate or misleading content from being submitted or shared. This implies a safer environment but may result in higher administrative management costs. Developers can consider it in future versions, but not in the first version of the application.

The following recommendations can improve the usability of the application and increase citizen engagement. To distinguish between requirements common to all pilots and requirements shared by several pilots, Figure 7 illustrates the frequency of occurrence of each requirement identified during the regional workshop.

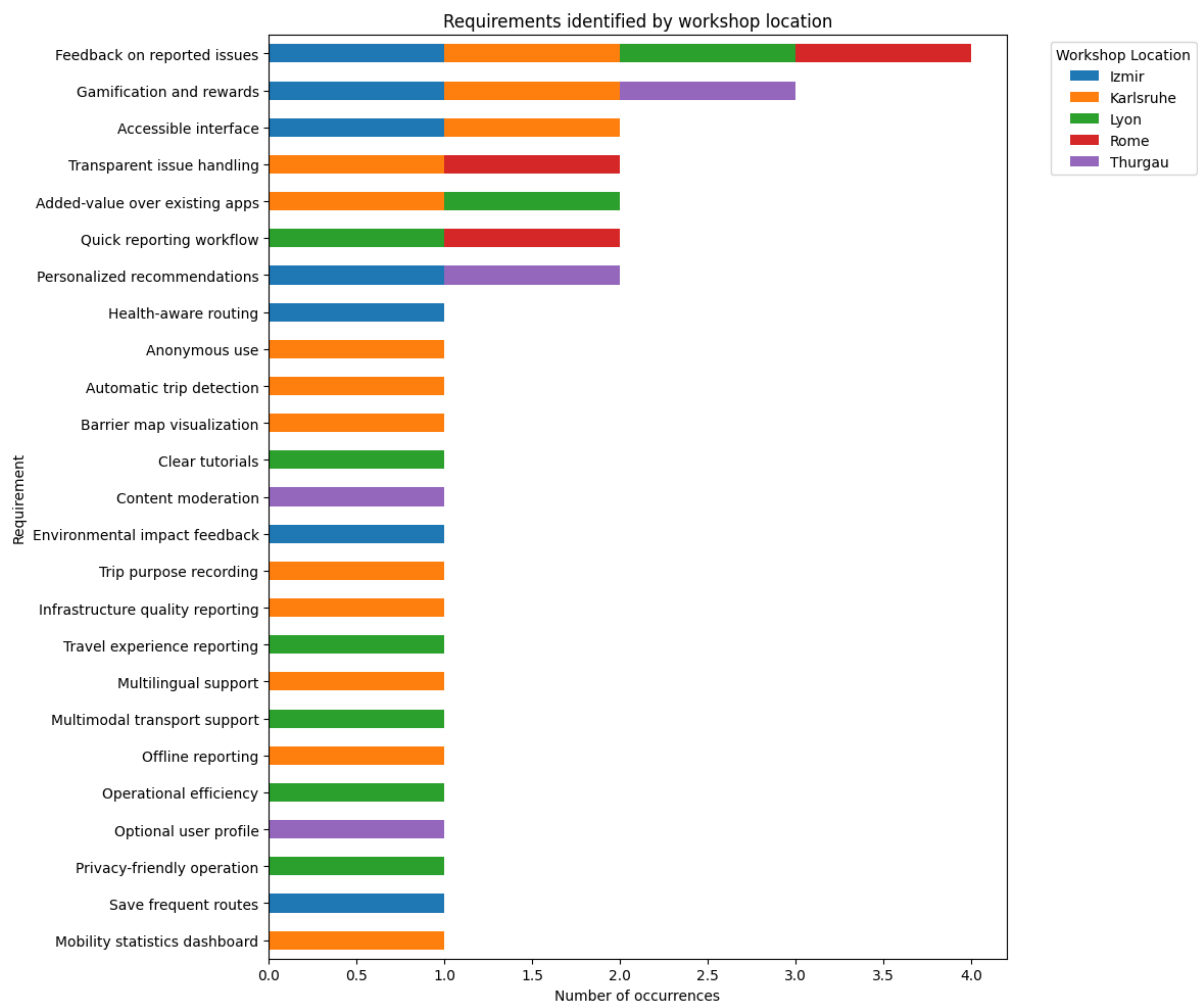


Figure 7: Requirements across regional workshops (Access Together)

3.3.3. Accessibility Analysis Platform

The workshops also produced key recommendations for developing an accessibility analysis platform that serves both citizens and planners. In Rome, the consensus was that accessibility should be represented through concrete mobility situations—such as age, strollers, or wheelchair use—while connecting these reported barriers to structured administrative workflows to ensure barriers are actionable. Participants in Karlsruhe prioritised the visualisation of barrier-free access to public transport and

requested transparency regarding the reasons behind specific barrier-free routing choices. They also proposed including the "attractiveness" of routes for active modes, taking into account factors like shading, weather conditions, sidewalk width, and safe crossings. Detailed infrastructure evaluations—including the maintenance of cycling paths, charging stations for e-bikes, and parking facilities—were deemed essential for encouraging active travel. To provide a better assessment for different user groups, it was suggested that profiles should consider age, gender, and user-defined walking speeds.

Safety and internal facility accessibility were prominent concerns in other cities. Izmir participants highlighted the need to identify critical infrastructure and provide details on internal conditions, such as the availability of accessible restrooms. They also emphasised digital inclusivity for groups such as color-blind individuals and suggested filters for perceived safety and barrier-free routes. In Lyon, planners noted that assessing accessibility requires considering the safety of physical infrastructure alongside environmental security and traffic conditions to ensure citizen protection. Economic accessibility was also a major point of discussion, with a focus on affordable mobility options for all social groups. Decision-makers in Lyon further suggested engaging diverse demographics through local associations and providing clearer definitions for concepts like "services" and "points of interest" to avoid ambiguity. Finally, participants in Thurgau expressed a need for real-time, reliable data including road steepness and elevator locations, alongside crowd-reporting features to keep information current. (Refer to Annex B Table 3 for a detailed summary of these recommendations)

The following requirements for WP3 follow from the aforementioned recommendations.

- **Administrative workflow integration:** The platform should support structured barriers management by assigning responsibilities, routing reports to the appropriate authority, and providing differentiated feedback workflows. This makes invisible barriers and action pathways more visible to planners. The implementation of this requirement is not feasible due to the complicated administrative process.
- **Barrier-free accessibility information:** The platform should provide comprehensive information on the accessibility of public transport, pedestrian infrastructure, and public facilities, which aligns with citizens' needs and preferences. This requirement is a pillar for the platform and a minimum design requirement for the application. The implementation of this requirement is entirely possible.
- **Route attractiveness assessment:** Accessibility analyses should also evaluate the attractiveness and comfort of walking and cycling routes, which encourages a modal shift towards active travel. This requirement can be implemented.

- Weather-aware accessibility: Accessibility assessments should account for weather conditions and environmental factors that influence mobility. This implies a more resilient system that better aligns with the daily comfort and mobility needs of users. This requirement can be implemented.
- Infrastructure quality assessment: The platform should evaluate the quality and condition of transport infrastructure, including cycling facilities, sidewalks, and destination accessibility, which aligns with citizens' needs and preferences. The implementation of this requirement is entirely possible.
- User mobility profiles: Accessibility analyses should be customised according to different user characteristics, including age, disabilities, travel purpose, and social context. This will provide a tailored assessment of accessibility for diverse social groups. This requirement can be implemented.
- Safety-aware accessibility: Route evaluations should consider safety indicators such as lighting, traffic conditions, visibility, and perceived security. This ensures the application aligns with citizens' preferences and improves safety. This requirement can be implemented.
- Critical infrastructure mapping: The platform should identify critical infrastructure and provide information about the internal accessibility of facilities. This ensures that the platform prioritises the physical protection and perceived security of citizens. This requirement cannot be implemented because information about internal accessibility is not available.
- Accessibility filters: Users should be able to filter accessibility analyses according to mobility needs, accessibility preferences, and perceived safety. This means that the platform will provide a flexible interface that addresses specific, varied user needs. This requirement can be implemented.
- Economic accessibility: Accessibility analyses should consider the affordability of mobility services and transport options. This ensures inclusive mobility for all social groups. This requirement can be partially implemented.
- Community engagement: The application should facilitate collaboration with local associations and organisations to improve citizen participation. In this way, the platform provides a more inclusive strategic framework that can effectively reach diverse and vulnerable populations. This requirement can be implemented.
- Clear terminology: Accessibility information should be presented using understandable terminology and practical examples that avoid ambiguous understanding for citizens. This requirement can be implemented.
- Citizen access to results: Citizens should have access to accessibility analyses, maps, and heatmaps to support informed mobility decisions. This requirement increases practical utility, which can attract more users and inform housing or relocation decisions. The implementation of this requirement is partially possible since most of the features of the platform are designed for urban planners.

- Crowd reporting: Users should be able to report and validate temporary accessibility barriers and infrastructure changes, which can increase trustworthiness and reliability. This requirement can be implemented.

To distinguish between requirements common to all pilots and requirements shared by several pilots, Figure 8 illustrates the frequency of occurrence of each requirement identified during the regional workshop.

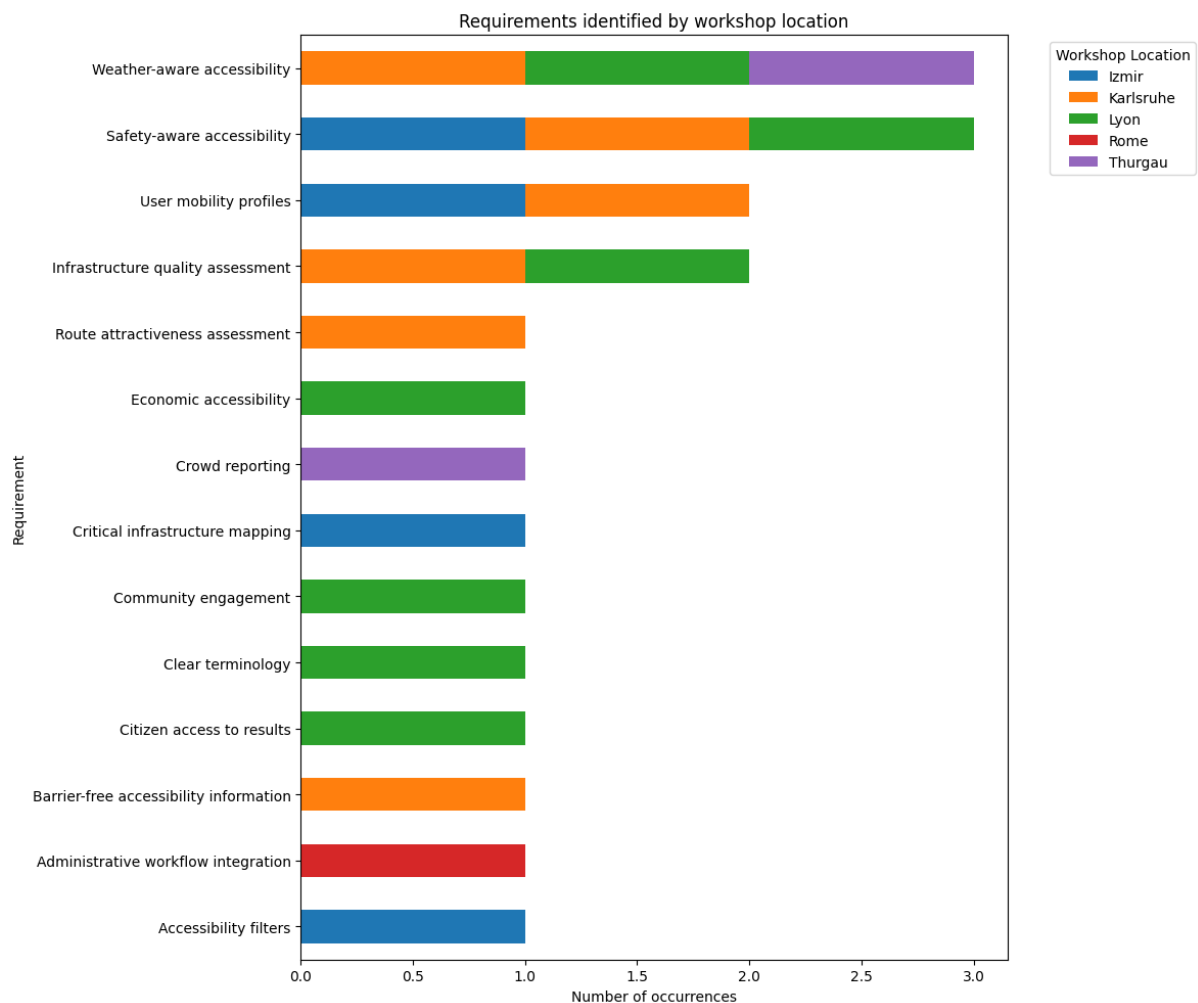


Figure 8: Requirements across regional workshops (Accessibility Analysis Platform)

3.3.4. Decision support system

Strategic recommendations for the Decision Support System (DSS) focused on reducing administrative workloads and improving the legitimacy of urban planning. In Rome, public offices indicated that the DSS has the most value when it reduces fragmentation by integrating multiple data channels and supporting explainable

prioritisation processes. This involves combining objective data with subjective user perceptions into a common analytical framework, allowing lived experiences to inform policy without replacing technical criteria. In Karlsruhe, participants requested that the system reflect weather and climate conditions, mobility perceptions, and the effects of street greening. They also discussed the functionality of sharing potential measures with citizens in a participatory format, though they noted that the complexity of such a tool requires strong moderation.

Data integration and operational efficiency were key themes in Izmir and Lyon. Izmir participants highlighted the importance of integrating citizen-generated data while acknowledging challenges related to data resolution and municipal governance bottlenecks. To enhance the system's effectiveness, Lyon workshop participants proposed using multidimensional indicators that combine quantitative metrics, like cyclist volume, with qualitative feedback to capture the perceived travel experience. It is also critical for the DSS to align with real-world operational procedures and synthesise planned interventions with citizen-driven inputs to remain reliable. Planners emphasised the importance of evaluating assets against accessibility norms and conducting economic impact analyses to justify intervention strategies. Establishing a clear hierarchy for interventions, supported by comprehensive explanations, was seen as essential for transparency. Finally, participants in Thurgau advised that simulation and visualization tools should prioritise simplicity—presenting one solution at a time with real-time results—while navigating legal frameworks early to avoid regulatory blockers. (Refer to Annex B Table 4 for a detailed summary of these recommendations).

The following requirements for WP3 follow from the aforementioned recommendations.

- **System interoperability:** The DSS should integrate with existing municipal information systems and administrative databases to facilitate data exchange and decision-making, which helps decision-makers translate dispersed inputs into usable decisions. The implementation of this requirement is partially possible because many responsible entities are not directly involved in the project.
- **Explainable decision-making:** The system should provide transparent explanations for intervention prioritisation and decision outcomes. This implies improved legitimacy of urban decisions by making the relationship between evidence and priorities understandable to both institutions and citizens. The implementation of this requirement is partially possible because the reason behind a decision could be derived from the result of a complex model. An explanation will be provided for the models.
- **Integrated evidence analysis:** The DSS should combine objective mobility data, GIS information, and citizen-generated data to support evidence-based planning. This implies that lived experiences can inform policy evaluation

without replacing necessary technical criteria. This requirement can be implemented.

- Climate and environmental analysis: Decision support should consider weather conditions, climate impacts, environmental indicators, and urban greening measures, which support sustainable urban planning. This requirement can be partially implemented.
- Citizen participation: The system should enable decision-makers to collect, evaluate, and incorporate citizen feedback during planning processes, which ensures a more democratic planning process. This requirement can be implemented.
- Simple user interface: The DSS should provide an intuitive interface with simplified indicators and visualisations suitable for non-technical users. This implies that the tool is user-friendly for non-technical users where simplicity is key to understanding results. This requirement can be implemented.
- Social and demographic analysis: Decision support should consider demographic, socioeconomic, and vulnerable population characteristics when evaluating interventions. This ensures that the tool is capable of evaluating interventions for vulnerable or disabled groups. This requirement can be implemented.
- Multimedia evidence: The system should support multimedia inputs such as photographs and videos to improve the validation of reported accessibility issues. This implies more accurate data validation and improved urban decision-making through objective proof. This requirement cannot be implemented because this feature is not defined as a core DSS validation function.
- Traffic and qualitative information: Traffic conditions and qualitative citizen feedback should complement quantitative mobility data, which implies that the tool will be an effective system that captures the human dimension beyond physical barriers. This requirement can be implemented.
- Operational workflow integration: The DSS should support existing planning, maintenance, and intervention management procedures within public administrations. This implies that the tool fits seamlessly into existing management workflows. The implementation of this requirement is partially possible because many responsible entities are not directly involved in the project.
- Integrated intervention planning: Planned interventions and citizen-reported issues should be analysed together to improve prioritisation, which helps to make the tools more efficient and attractive to institutional users. This requirement can be implemented.
- Infrastructure condition assessment: The system should assess infrastructure functionality and compliance with accessibility standards. This requirement improves system reliability by focusing on asset compliance and functionality. This requirement can be implemented partially.

- Impact and cost-benefit analysis: Proposed interventions should be evaluated according to their expected impacts, implementation costs and anticipated benefits. This requirement aims to increase administrative efficiency by justifying strategic planning choices. The implementation of this requirement is not possible since it requires extensive effort and unavailable information, which make it unfeasible within the time frame of the project.
- Intervention prioritisation: The DSS should prioritise interventions according to multiple criteria including urgency, accessibility impact, feasibility and available resources. This ensures a more transparent and understandable prioritisation process. This requirement can be implemented.
- Scalable real-time platform: The platform should process dynamic information efficiently while remaining scalable for increasing data volumes and users. This requirement ensures that the system can handle complex, real-time urban reporting. This requirement can be partially implemented.
- Multilingual support: The DSS should provide multilingual interfaces to support diverse stakeholders, ensuring accessibility to diverse stakeholders. This requirement can be implemented.
- Simulation and visualisation: Decision-makers should be able to compare intervention scenarios using interactive visualisations and simulation tools, which help to compare scenarios more effectively. This requirement can be implemented.
- Regulatory compliance: The DSS should support planning decisions that comply with applicable legislation, regulations, and accessibility standards. This requirement avoids potential legal blockers during tool adoption. The implementation of this requirement is not possible because such a feature is not a core component of the DSS tool.

To distinguish between requirements common to all pilots and requirements shared by several pilots, Figure 9 illustrates the frequency of occurrence of each requirement identified during the regional workshop.

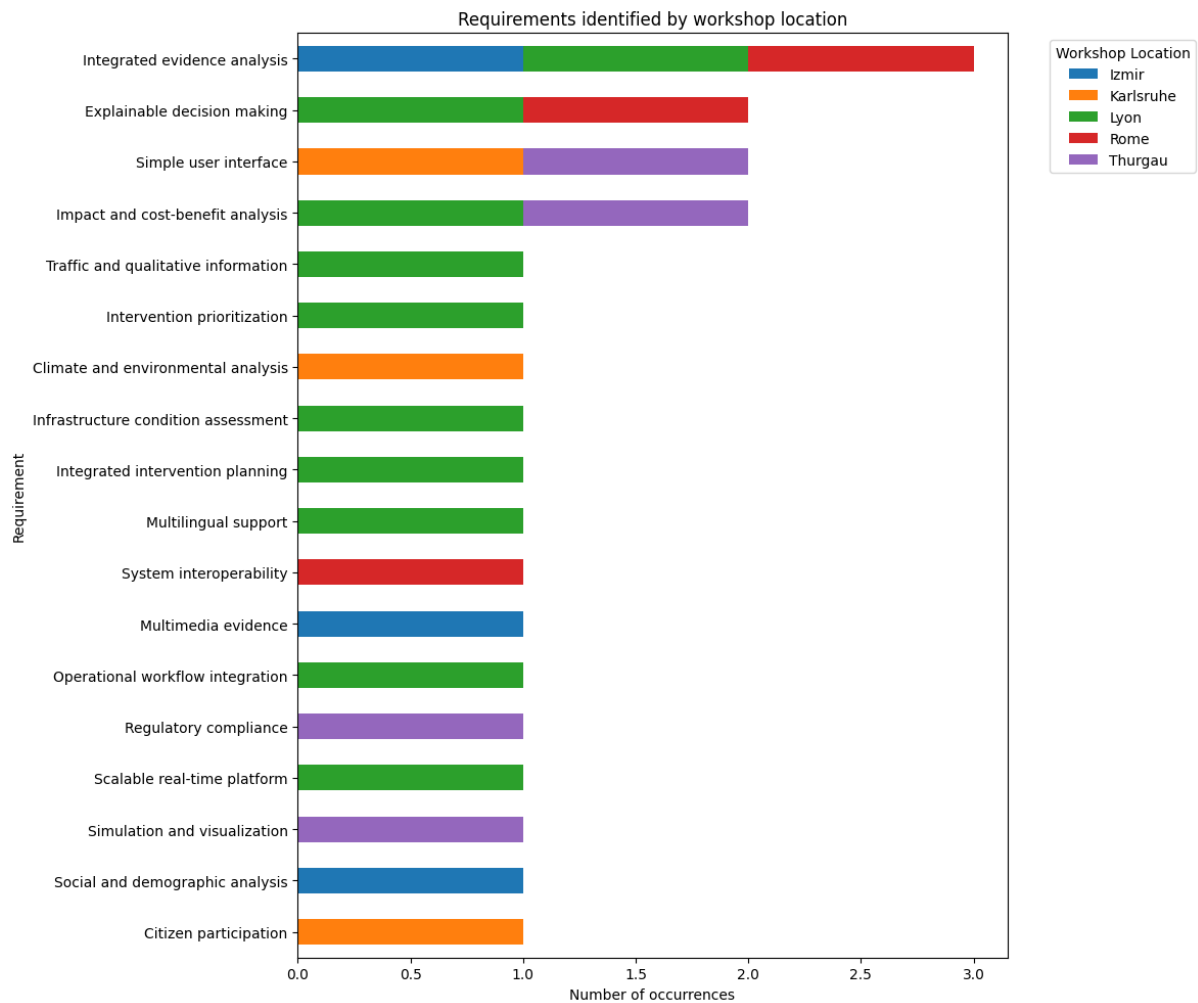


Figure 9: Requirements across regional workshops (Decision Support System)

3.4. Identification of Personas for the Usability Testing

To design personas, we first start by investigating contextual knowledge related to local population characteristics based on available information resources [27] [28]. Taking into account the conclusion of these investigations (for example, gender repartition, age groups repartition, categories of professions repartition, commuting distance repartitions, car dependence repartition, etc), five personas have been identified. Inspired by existing designed personas for mobility studies, a template for defining the persona has been created. The template of the personas suggested includes five sections. Demographics, Mobility use frequency per week, Digital solution usage, Behaviours, and residual environment. In the following, we present the identified personas. Five preliminary proto-personas were determined:

- **Public transport-dependent commuter:** defining the group of citizens highly dependent on public transport for daily commuting and who do not feel comfortable using active mobility modes for a variety of reasons, including the distances.
- **Active local traveller:** defining the group of citizens who are comfortable with active mobility modes and are not willing to switch to private cars under different conditions.
- **Cost-conscious active cyclist:** defining the group of citizens who opt for active mobility modes for their low cost and who can switch to a private car if they have a better income.
- **Car-oriented long-distance traveller:** defining the group of citizens who opt for car use for commuting because of a variety of challenges they face while using other mobility options, such as the safety in public transport, inadequate cycling infrastructure, but who are willing to switch to public transport or active mobility modes if these challenges are solved.

Table 5: Public Transport-Dependent Commuter

Demographics					
Name	Age	Marital Status	Profession	Nb Household	income
Josephine	42	Married	intermediate professions	5	Medium
Mobility use frequency per week					
Car in the household: Yes					
Personal owned mobility mode: Car, Bike, Motorcycle, Scooter, None					
Frequency of use of PT	Frequency of cycling		Frequency of walking	Frequency of car driving	Most frequent commuting distance
Everyday	Never She does not feel comfortable with		Sometimes She walks to the nearby	Never She does not drive.	>7.5km

She uses PT to commute to work on working days.	cycling because of the large distance and the weather conditions	stores, and sometimes she walks her young girl back home from kindergarten	Although her family owns a car.	
Digital solution usage				
Use of PT applications	Digital skills	Use of a shared mobility app		
High She uses the PT application to check the schedules of buses using her smartphone. She is confident in her ability to plan a mobility journey using PT applications.	Medium She uses digital solutions to send and receive messages. She is moderately engaged with technologies.	Never		
Behaviours and residual environment				
Living conditions	Social life	behavioural traits	Scenarios using mobility services	
Josephine lives on the outskirts of the city of Lyon. She completed university-level education and currently she works as administrative assistant. Her daily schedule is tight with responsibilities and full-time working tasks. She has a limited access to most of administrative services by walking.	Josephine likes to spend social time with her family during weekends and holidays. She does not practice sports frequently.	Josephine prefers to avoid risk which affect her willingness to take night public transport or use unfamiliar mode. Due to her full-time job she has low tolerance to delay. She finds public transport option as a reasonable low-cost solution.	Buses disruptions and delays can cause a critical issue for her daily schedule. She avoids to use PT at night and prefer to use private car in case of disruptions of PT.	

Table 6: Active Local Traveler

Demographics					
Name	Age	Marital Status	Profession	Nb Household	Income
Gabriel	68	Married	retired	2	Low
Mobility use frequency per week					
Car in the household: No					
Personal owned mobility mode: Bike					
Frequency of use of PT	Frequency of cycling	Frequency of walking	Frequency of car driving	Most frequent commuting distance	
Sometimes Gabriel uses PT sometimes to reach the administrative and health services	Frequently Gabriel uses his bike to reach amenities in his vicinity, such as groceries, coffee shops, pharmacies, etc.	Sometimes	Never	<5km	
Digital solution usage					
Use of PT applications	Digital skills	Use of a shared mobility app			
Low	Low	Never			
Behaviours and residual environment					
Living conditions	Social life	behavioural traits		Scenarios using mobility services	

Gabriel lives on the outskirts of the city of Lyon. He suffers from a chronic disease and needs periodic check-ups with his general practitioner.	Gabriel likes to spend some time with friends or join social seniors' activities.	Gabriel does not prefer long-distance trips. He avoids crowded public transport hubs. He does not feel confident using digital services for PT. He also avoids cycling at night.	Gabriel does not feel safe using his bike on roads without bike lanes. Sometimes he uses a pedestrian's sidewalk for cycling. He avoids to cycle under hard weather conditions. Sometimes he lost control easily, especially with weak infrastructure.
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Table 7: Cost-Conscious Active Cyclist

Demographics					
Name	Age	Marital Status	Profession	Nb Household	Income
Caroline	23	Single	Student	1	Low
Mobility use frequency per week Car in the household: No Personal owned mobility mode: Bike					
Frequency of use of PT	Frequency of cycling	Frequency of walking	Frequency of car driving	Most frequent commuting distance	
Sometimes She is comfortable with the use of PT for long, non-frequent travels.	Everyday She commutes most of the time by bike for diverse needs. She	Sometimes	Never	<5km	

	finds it suitable because of its low cost.			
Digital solution usage				
Use of PT applications	Digital skills	Use of a shared mobility app		
Medium She feels confident in using digital solutions and prefers to buy her tickets online to avoid long queues.	High She uses the internet daily, and she accesses the PT schedules and buys her tickets. She also uses her smartphone to find new routes to go around the city.	High She uses the mobile application of her bike operator daily. She benefits from low-cost PT and cheap shared bicycle plans.		
Behaviours and residual environment				
Living conditions	Social life	behavioural traits	Scenarios using mobility services	
Caroline rents a studio near her university. She likes sports and practices frequently.	Caroline likes to participate in diverse social activities. She is a member of a local music club. Also, she likes to participate in seasonal activities like hiking and skating.	She does not feel comfortable with the maintenance of the bike, and she finds it suitable to use a shared bike plan where operators handle all repairs. She does not appreciate having a station so far from her destination.	Caroline finds it difficult to cycle in hard weather conditions, which obliges her to use PT for long trips and walk if her destination is within her proximity.	

Table 8: Car-Oriented Long-Distance Traveler

Demographics					
Name	Age	Marital Status	Profession	Nb Household	Income
Charlotte	35	Single	Intellectual profession	1	High
Mobility use frequency per week					
Car in the household: Yes					
Personal owned mobility mode: Car					
Frequency of use of PT	Frequency of cycling	Frequency of walking	Frequency of car driving	Most frequent commuting distance	
Sometimes	Never	Sometimes	High	>7.5km	
Digital solution usage					
Use of PT applications	Digital skills	Use of a shared mobility app			
Low Charlotte does not frequently use pt. She finds it not completely safe for her early morning and late-night shifts	High She is confident about using digital solutions. Although she did not feel the need to use mobility digital solutions only in some situations.	Never			
Behaviours and residual environment					

Living conditions	Social life	behavioural traits	Scenarios using mobility services
She lives on the outskirts of the city and works in a hospital far from her apartment.	Charlotte frequently practices sports in her sports club, but she prefers to use her car to reach it.	Charlotte has a strict timing in her working shifts and prefers to avoid traffic congestion by leaving early. Although she finds car use costs, including maintenance, fuel, and insurance, are relatively high, she finds it a safer door-to-door solution.	She used to travel by car and prefers to use it for most of her commutes.

Table 9: Car-Dependent Long-Distance Commuter

Demographics					
Name	Age	Marital Status	Profession	Nb Household	Income
André	51	Married	intermediate professions	4	Medium
Mobility use frequency per week Car in the household: Yes Personal owned mobility mode: Car					
Frequency of use of PT	Frequency of cycling	Frequency of walking	Frequency of car driving	Most frequent commuting distance	

Low André does not use PT frequently. Since he usually uses a private car for commuting. Also, he prefers to use a car for family trips.	Low	Sometimes	High	>7.5km
Digital solution usage				
Use of PT applications	Digital skills	Use of a shared mobility app		
Low	Medium André has medium digital skills. He uses his phone frequently for messaging and uses digital solutions for most of his administrative tasks. He is confident that he can use digital mobility solutions.	Never		
Behaviours and residual environment				
Living conditions	Social life	behavioural traits	Scenarios using mobility services	
André lives with his family in a house (owned) in the peripheral area of the city. He has two kids at school. He is an administrative staff member at a governmental institution. Daily André has to drive his kids to school.	André spends most of his time at work or with the family. During holidays, they do family trips, but he finds using a private car is more suitable, with or without kids.	He is very dependent on his car, although he finds it difficult to cover the monthly cost. But for him, a car is a priority.	Since he used to commute by car. André finds that the restrictions and parking policies are becoming stricter. Also, the low-emission zones created more restrictions for door-to-door travel.	

Although, the smart urbanity project targets the inclusiveness of different social groups, the defined personas do not model all the groups of the populations. The aims of definitions of these personas to define the majors profile based on the

sociodemographic data and on mobility habits. Additional groups of citizens like citizens with specific impairment, children etc are not modelled as personas since the involvement of these groups is not in the scope of the smart urbanity project.

3.4 Methodology for usability testing

3.4.1. A Citizen Engagement Mobile App: Access Together

To ensure that the Access Together application provides a user-friendly solution, usability testing will be conducted. The methodology used for the Access Together application will follow a task-based testing approach where participants will be asked to complete specific assignments using the developed application. The formal usability testing was scheduled for February 2026, however to delay on the deployment of the mobile application in mobile application store, the testing was postponed. The mobile application was deployed in July 2026. Based on the updated action plan, the testing will be conducted by ENTPE in September 2026. In this deliverable, we will provide the plan for future usability testing. Although the current phase is predominantly qualitative, quantitative testing findings will follow from the usability testing.

The application will be tested in two phases. The first sessions will involve 12 users, including seniors, students and adults, as well as foreigners (non-French speakers). These users have been invited to join the testing sessions at the end of the workshop conducted in Lyon. Since ENTPE members are responsible for the usability testing, all the participants are located in Lyon to facilitate communication using the local language during the sessions.

Table 10: Usability testing plan for Access Together

Features	Testing phases and metrics
Login and onboarding process: User registration, password lost, request for a new password, and access to the application	Phase1 Metrics: Task completion rate, user subjective rating
Trip Tracker: start and end of trip tracking: Selection of the transport mode and the possibility to change mode during the trip.	Phase1 Metrics: Task completion rate, user subjective rating

Visualisation of trip history; Access to detailed trip information	Phase1 Metrics: Task completion rate, user subjective rating
Reporting of barriers	Phase2 Metrics: Task completion rate, completion time, user subjective rating
Reward conversion	Phase2 Metrics: Task completion rate, user subjective rating
Collective challenges	Phase2 Metrics: Task completion rate, user subjective rating

The first testing phase will consist of three sessions. All the sessions will be conducted online. Each session will include 4 citizens and one coordinator. The assessment will be based on a task-specific observation of a defined scenario. Usability assessment metrics that will be explored in this phase are: ease of use, clarity of information (questionnaire), user experience (understand real user workflows and identify where we can improve), intuitive navigation (assess whether navigating and using the plug-in feels natural and clear), and trust and privacy comfort. For each feature, one or two scenarios will be defined to test the task.

3.4.2 An Accessibility Analysis Platform

3.4.2.1 Access Atlas

The access Atlas mainly allows the exploration of the reachability of a defined set of services for a specific user group and for different thresholds. Also, it allows the user to identify the most served and unserved zones. Table 11 shows the features to test for the Access Atlas tool.

Table 11: Usability testing plan for Access Atlas tool

Features	Testing phases	Estimated timing	Description
Explore accessibility based on specific setup (group of users, threshold, services)	Phase 1: Three sessions The session takes 30 minutes	5 minutes	Users will be asked to select a specific setup and find the accessibility. Metrics: time to complete the task, task completion rate, user subjective rating
Interpretation of the charts on the Access Inspector	Phase 1: Three sessions The session takes 30 minutes	5 minutes	The user will be asked to describe the statistical charts and identify the most-served and most-unserved zones. Metrics: time to complete the task, task completion rate, user subjective rating

Interpretation of the charts on the Reach Explore	Phase 1: Three sessions The session takes 30 minutes	5 minutes	The user will be asked to describe the statistical charts and explore an overview of the reachable opportunities. Metrics: time to complete the task, task completion rate user subjective rating
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3.4.2.2 Access Hub

The Access Hub, on the other hand, allows users to add feedback on the accessibility of their neighbourhood and report possible barriers. In addition, it allows users to add non-existing services, vote on the accessibility of existing services and suggest interventions. Table 12 shows the details of the features to test for this tool.

Table 12: Usability testing for Access Hub tool

Features	Testing phases	Estimated timing	Description
Report accessibility barriers	Phase 1: Three sessions The session takes 1.5 hours.	2 minutes	The user will be asked to add an example of a mobility barrier. Metrics: time to complete the task, task completion rate, user subjective rating

Add service	Phase 1: Three sessions The session takes 1.5 hours.	2 minutes	The user will be asked to add an example of an existing service. Metrics: time to complete the task, task completion rate, user subjective rating
Vote existing service	Phase 1: Three sessions The session takes 1.5 hours.	1 minutes	The user will be asked to vote on the accessibility of existing services. Metrics: time to complete the task, task completion rate, user subjective rating
Suggest intervention	Phase 1: Three sessions The session takes 1.5 hours.	2 minutes	The user will be asked to pick a location and suggest an intervention. Metrics: time to complete the task, task completion rate, user subjective rating

3.4.2.3 Decision Support Systems (DSS)

For decision support systems, although the tool development is in the initial phase. The testing of this tool will involve only pilot leaders from different countries. The testing will focus on the features of modelling the interventions and their execution,



and comparisons. Also, it assesses the clarity of recommendations of the system as the best intervention to implement. In addition, the tool will assess the impact of the intervention on improving the accessibility of different social groups.

Table 13: Usability testing plan for decision support system

Features	Testing phases	Estimated timing	Description
Modelling and saving an intervention Import and run the saved intervention	Phase 1: Three session The session takes 1.5 hours.	15 minutes	The users will be asked to model and parametrise simple interventions in a simulation. The users will be asked to save, import and run the created simulation. Metrics: time to complete the task, task completion rate, user subjective rating
Import existing interventions Run the recommendation model Output of the recommendations	Phase 1: Three sessions The session takes 1.5 hours.	15 minutes	The users will be asked to import the created simulations and run the model to compare all the interventions. The system will provide the most

			optimised intervention. Metrics: time to complete the task, task completion rate, user subjective rating
Assessment of the effect of interventions on the defined group of users	Phase 1: Three sessions. The session takes 1.5 hours.	15 minutes	Using the existing groups. The user will be asked to use the tool to assess the impact of a selected intervention on the accessibility of the groups. Metrics: time to complete the task, task completion rate, user subjective rating

3.5 Ethical procedures

To ensure ethical data processing, the project follows a formal activity agreement (activity registration form) which adheres to the principle of data minimisation by limiting data collection to strictly necessary information. The Access Together application integrates data collection where the initial storage space will be managed by Movision. At this stage, ENTPE will be responsible for conducting the usability testing. At this phase, ENTPE will only store data about usability testing (not personal users' data). Collected data will be stored in SDRIVE, with GDPR traceability maintained through comprehensive event logging on the SDRIVE CNRS infrastructure, which records user IDs, connection timestamps, IP addresses, and all file or administrative operations. Data is protected in transit via HTTPS and TLS protocols, and the project ensures that any potential data transfers outside the European Union are governed by the safeguards defined in GDPR Articles 46, 47, and 49.

Ethical procedures for qualitative engagements, such as workshops, usability testing's interviews, involve transcribing contributions and opinions to produce anonymised summaries for citizens and public decision-makers. For the Access Together digital



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tool, technical security and pseudonymisation are enforced through the use of named accounts with strong password authentication protected by secure hashing.

Below we present only the categories of the data collected during usability testing. Although this information will not be processed at this stage.

- Civil status, identity, and identification data: This includes age group, gender, area of residence, occupation, income, marital status, number of households, level of higher education, main activity, and physical condition.
- Professional life: This category specifically includes information regarding education.
- Location data: This includes movement and GPS data.
- Other categories of data: Discussions and contributions: transcripts of interviews, questionnaire responses, opinions, perceptions, feedback, and evaluations or ratings.

Finally, all processed information is subject to a clear retention period of 5 years.

4. Discussion

4.1 Interpretation of Results

This section will provide an interpretation of the results of the LR findings and the workshop's outcomes.

The factors influencing user preferences may differ across mobility services. For public transport services, the major areas of research focus on travel experience, the quality of the service provided and the urban properties. However, studies do not thoroughly examine factors related to user profiles and contextual conditions, such as crowding queues and parking unavailability. The factors affecting the user preferences include the waiting time, security and safety, travel time, reliability, convenience, comfort, ticket flexibility and easiness to pay. The relevance of each factor depends on the context, such as cultural background, weather and geolocation of the city. For the active mobility modes, infrastructure, urban settings, safety, coverage and capacity of the shared active mobility services, the built-in environment plays a relevant role.

The study of the challenges and barriers citizens face in the five pilot cities shows similarities in most identified barriers alongside some local differences. Regarding safety concerns, both Lyon, Izmir and Karlsruhe highlighted the importance and the challenges that citizens face related to the safety of individuals and their mobility modes. Car dependency was listed as a main concern in Rome, Lyon, and the suburban areas of Thurgau. Infrastructure was emphasised as a major concern in Rome, Izmir and Karlsruhe, especially regarding the infrastructure aspects that affect accessibility. Challenges regarding the reliability of public transport information were

reported by citizens in Lyon, while Thurgau's citizens face difficulties with public transport frequency in the suburbs.

Insights and recommendations about the digital tools were collected from the workshops. For Access Together, participants from Rome, Lyon, and Karlsruhe expressed interest in having a feedback mechanism for reported events. This mechanism should present the status of the reported event and identify the organisation responsible for quality control. Participants from Karlsruhe and Lyon also highlighted the need for easy and fast reporting features. Users prefer that these features do not require internet connectivity and use optimised battery consumption. Also, they prefer to be able to access and use the application without needing to create an account. Participants in Lyon suggested including documentation or tutorials to make the use of the application easiest. Furthermore, participants from Karlsruhe expressed interest in visualising events reported by other citizens to avoid duplicate reports. In these same cities and also in Izmir participants emphasised the importance of infrastructure and the link between the non-functional infrastructure and a negative perceived travel experience, while also reporting concerns regarding the privacy of collected information. Participants from Izmir also reported the importance of internal accessibility at destinations and sidewalks transitions. Participants from Karlsruhe, Izmir, Lyon and Thurgau all highlighted the importance of reporting safety concerns. Thurgau's participants also suggested uploading images for the report of the events.

The aim of this application is to include diverse social groups in the design and implementation process to improve accessibility in different contexts and urban settings. Consequently, this digital solution must include younger citizens under 18 years old, provide suitable features for visually impaired users and consider multimodal transport modes like buses and trams which are used by the majority of residents with medium and low economic profiles. Concerning the visualisation feature, participants from Karlsruhe suggested visualizing not only the individual's statistical summary of individual activities but also, to visualise collective mobility statistics.

To avoid duplication with existing platforms, participants from Karlsruhe and Lyon suggested clearly demonstrating the applications' added value and unique features compared to other solutions. Finally, participants from Thurgau, Lyon and Karlsruhe emphasised the importance of user motivation to encourage daily engagement with the application. Some users suggested rewarding reported events based on their frequency and reliability, while others proposed creating seasonal challenges between users and their social connections.

For the accessibility analysis platform, the user insights focus on four main aspects:

- **Filtering features:** Many participants highlighted the importance of this feature. They propose to extend it by including information related to the demographic



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properties (gender, age) and mobility difficulties like mobility impairment and situational information like the use of strollers.

- **User and mobility profile:** participants suggested including additional user-related information that may affect the mobility profile, like situational/contextual attributes (the type of destination, travelling with children, carrying luggage)
- **Accessibility map features:** This feature was the main focus of the discussion of all the workshops. The participants appreciate the visualisation of physical accessibility, including infrastructure-related properties. However, they also prefer to have an idea about facilities at their destination (e.g., parking, stairs,) and the accessibility properties that may be affected by weather. In addition, they appreciate taking into consideration safety concerns (traffic accidents, individual conflicts and lightning), but they prefer to have clear and real-time information about the reason behind weak accessibility via the mapping of the safety concerns. They suggested including a filtering option for this feature (filtering by services and social groups) and including the attractiveness of the segments for walking and cycling activities.
- **Inclusiveness:** Participants point out the need to consider different social groups like elders, socioeconomically disadvantaged groups and non-local-language speakers.
- **Reuse:** Participants emphasised the role of this application in other contexts, such as house renting. So, they recommend allowing access to the application for other parties.
- **Supported languages:** The application should profile sufficient language settings that ensure a full translation of all the features for the selection of the languages.

Regarding the Decision Support System DSS, many decision-makers emphasised the importance of including the economic impact of simulated interventions through cost/benefit analyses. Also, from their perspective, it is crucial to align the system with the operational procedures used to define intervention priorities within their organisations. Participants also noted that reporting tools need to incorporate both quantitative and qualitative data from citizens, such as specific comments and perceived travel experiences alongside weather and climate information.

Furthermore, when requesting interventions, urban norms must be assessed as these evaluations directly affect the prioritisation process. This hierarchy is also influenced by the priority by budget constraints of the city, institutional competencies, and safety regulations. Additionally, participants suggested assessing and visualising the environmental and climate impacts of potential measures. Finally, citizens expressed

a preference for transparency, aiming to clearly understand the rationale behind specific interventions and why one action is prioritised over others.

4.2 Implications

The findings from the literature review and regional workshops provide relevant implications for the next development phase of SmartUrbanity. Overall, the findings confirm the relevance of combining citizen participation, accessibility intelligence, and decision support within one coherent digital ecosystem rather than through isolated applications.

For the citizen engagement tools, Access Together and Access Hub, the results support their continued development as lightweight, inclusive, and user-friendly participation channels capable of collecting both behavioural and experiential data. This includes trip-related information, contextual constraints, perceptions of safety and comfort, reported barriers, and feedback on services and infrastructure. The findings also highlight that participation mechanisms should minimise user effort, promote transparency, and clearly demonstrate how citizen contributions are translated into tangible public value.

For the analytical environment of SmartUrbanity, particularly Access Atlas, the results reinforce the need to move beyond conventional accessibility measures based only on time and distance. Development should therefore continue integrating multidimensional accessibility indicators that reflect infrastructure quality, environmental conditions, affordability, perceived safety, and heterogeneous user needs. The workshop outcomes also validate the strategic importance of user profiles and scenario-based filters to represent how accessibility changes across groups, times of day, and local conditions.

For the modelling components, the findings support the planned evolution toward calibrated and evidence-based accessibility models. Citizen-generated data, surveys, and mobility traces can progressively support the estimation of behavioural parameters, perceived effort factors, and differentiated mobility profiles. This confirms the value of SmartUrbanity as a research-informed platform where real user evidence continuously strengthens analytical robustness.

For the Decision Support System, the results indicate that future development should prioritise explainable and transparent prioritisation logic, scenario comparison, and practical relevance for local administrations. Decision-makers require tools capable of combining technical indicators, citizen feedback, budget constraints, regulatory criteria, and social equity objectives. The future DSS should therefore support intervention testing and communicate expected impacts in a clear and understandable way.

Across all components, the findings underline the importance of interoperability. Data collected through participatory tools should progressively enrich analytical models and decision-support functions, while the outputs of these tools should be translated into understandable feedback for citizens and stakeholders. This reciprocal loop is central to the SmartUrbanity concept.

Finally, the results support a phased implementation strategy. Core functionalities such as reliable data collection, clear dashboards, and robust accessibility analysis should remain the first priority, while more advanced features such as complex simulations, external model integration, and extended personalization can be progressively introduced according to pilot maturity, available datasets, and operational needs.

4.3 Limitations

The findings presented in this deliverable provide a robust basis for improving the SmartUrbanity digital tools; however, they should be interpreted in light of a number of methodological, operational, and implementation-related limitations. First, the recommendations collected through the literature review and regional workshops reflect relevant user expectations, perceived needs, and desirable directions for future development, but they do not necessarily correspond to functionalities that can all be implemented within the current pilot phase. The present stage of the project is primarily aimed at validating the overall logic of the prototype, testing key user interaction flows, and assessing the relevance of the digital tools in real-world pilot contexts. As a result, the recommendations presented in this deliverable should be understood as a prioritised design input for progressive development rather than as an immediate implementation roadmap covering all requested features.

A first limitation concerns the scope and maturity level of the pilot environment. The current phase focuses on the validation of core functionalities related to citizen reporting, trip and experience data collection, accessibility visualisation, and the general interaction logic of the SmartUrbanity ecosystem. By contrast, several recommendations emerging from the workshops imply a level of technical, organisational, and institutional maturity that exceeds the purpose of a prototype-based pilot. This applies, for example, to full interoperability with existing administrative systems, automatic issue routing to public offices, integration with pre-existing mobility or municipal platforms, and the activation of structured workflows across third-party actors. These features are highly relevant from a long-term deployment perspective, but their implementation requires stable interfaces, clear governance arrangements, institutional coordination, and operational agreements that are outside the current pilot scope. For this reason, such functionalities should be considered part of a future go-live phase rather than a requirement of the present prototype validation stage.



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A second limitation concerns the operational burden associated with some of the proposed features. A number of recommendations assume the existence of continuous moderation processes, permanent quality assurance, real-time validation of user-generated reports, and regular updating of dynamic information. While these functions could significantly strengthen the reliability and usefulness of the tools, they would also require dedicated resources, clearly assigned institutional responsibilities, and sustainable maintenance processes that are not yet fully available across all pilot territories. In this sense, the pilot can help clarify which governance and moderation mechanisms may be needed in the future, but it cannot ensure the full operationalisation of all of them within the current project phase.

Another important limitation concerns digital accessibility. The project fully recognises the importance of making Access Together and the other SmartUrbanity tools as inclusive as possible for users with different abilities, including users with visual impairments. However, within the current prototype and pilot phase, the objective is to optimise the interfaces according to accessibility-oriented design principles, improve readability and navigability, and identify the most relevant barriers through testing and feedback collection. The pilot therefore represents an important step toward more inclusive future versions, but it does not include the full implementation of advanced assistive functionalities, exhaustive compliance with all accessibility requirements, or formal accessibility certification procedures. In particular, for visually impaired users, the project can reasonably commit to improving the interface as far as possible within the prototype constraints and to using the pilot to identify priorities for subsequent refinement, but not to delivering a fully accessibility-certified application at this stage.

Additional limitations also emerge in relation to the representativeness of the user groups involved in testing and workshop activities. Although the project adopts an inclusive approach and explicitly considers the needs of diverse social groups, not all population categories can be fully represented within the current testing framework. This is especially true for groups whose participation entails additional legal, ethical, or procedural constraints, such as minors or users requiring specific support arrangements. Consequently, some recommendations should be read as important strategic directions for future development rather than as requirements that can be comprehensively validated in the current pilot cycle.

5 Conclusions and Recommendations

5.1. Conclusions

The literature review and workshops yielded several shared insights regarding mobility attributes, safety, reliability, and urban settings were identified as critical factors to consider when designing digital mobility solutions. Additionally, factors such as travel and waiting times, service reliability, traffic properties, and physical accessibility are essential to citizens based on research and participant feedback.



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Given the current state of mobility services, many citizens expect future solutions to address the accessibility of road infrastructure and facilities at destinations, such as secure parking and barrier-free building access for people with mobility impairments. Furthermore, weather-dependent accessibility must be addressed. Users prefer a clear view of current conditions during harsh weather and information on available mobility alternatives. While participants valued the ability to report diverse accessibility issues, they expect a feedback mechanism to track the status of reported barriers. However, discussions with stakeholders indicate that implementing this feedback feature is currently challenging within the project's scope.

The applications were particularly appreciated for their inclusivity, especially in meeting the needs of older adults, socioeconomically disadvantaged groups, foreigners, rural residents, and children. While the project prioritises inclusiveness, the inclusion of minors involves complex GDPR procedures; consequently, citizens under 18 years old will not participate in the current testing sessions or pilots.

Finally, findings suggest that citizens view the mobility experience as a holistic journey encompassing all modes used, total waiting times, and service reliability. Finally, user decisions regarding preferred transport modes depend heavily on contextual factors such as travelling with children, handling luggage or strollers, and prevailing weather conditions.

5.2. Recommendations for Digital Solutions

In this section, the recommendations for digital solutions will be summarised.

First, for the citizen engagement application that targets all groups of citizens, we derived the following recommendations:

- The application needs to be very easy to use;
- It should include a mechanism allowing people with visual impairment to interact with the application and use it;
- The barriers-reporting activity tracking features should have an optimisation of battery usage;
- The application should describe how the citizen data will be handled, for which purpose and by which parties;
- The application should support foreign languages;
- The application should include statistics about individuals as well as marginal statistics of groups with similar user and mobility profiles;
- Gamification can be extended, allowing group challenges;



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- Rewards should take into consideration not only the mobility activity of the individual but also the reliable information reported by the individual;
- The reporting feature should be possible in online and offline mode (information is stored locally and uploaded once connectivity is re-established);
- The profile of the user can be extended by including information about mobility profile like walking speed, moving independently or not, using a stroller or not, etc;
- The application could allow the user to report barriers without creating an account;
- The application should avoid replication of the same reported barriers;
- The application should have a feedback mechanism to update the users about the state of the reported accessibility barriers;
- The application should be light in terms of speed, especially for the reporting features;
- The application should allow the user to report accessibility barriers in a minimum number of clicks.

For the accessibility analysis, from the current derived insights:

- The application should allow citizens to access accessibility heatmap;
- The accessibility heatmap should allow users to filter the displayed data based on social demographics information, mobility profiles and situational information and services;
- The accessibility heatmap should clearly present the reason behind the values (low or high) accessibility scores;
- An extended feature could be added, presenting the attractiveness of road segments and neighbourhoods to active mobility like walking and cycling;
- The application should be intuitive and easy to use;
- The application should clearly explain to the users the reason behind possible malfunctioning (Example: The imported file did not use the appropriate projection system EPSG 4171);
- The application should provide clear documentation to the users;

- It will be better if the application can explain the effect of weather conditions on the accessibility scores;
- The determined accessibility should take into consideration the cost, safety, environmental properties (shading, freshness), details in the provided on-path infrastructure and infrastructure at the destination.

Finally, for the decision support system,

- The tool should be easy and intuitive to use;
- The tool should align with the norms and regulations used to define priorities in operational interventions of the decision makers;
- The tool should provide a transparent final intervention as well as a clear and comprehensible explanation of the reasoning behind the selected intervention;
- The assessment of the intervention should consider its efficiency under different weather conditions and with multimodal mobility options;
- The tool could provide the possibility to assess the effect of the intervention on the accessibility of different groups.

5.3. Design Recommendations

Based on the findings of the literature review, the regional workshops, and the overall discussion developed in this deliverable, the design strategy for the SmartUrbanity digital tools should follow a user-centred, implementation-aware, and progressive approach. Across all components, the results show that the long-term value of the ecosystem depends not only on the range of functionalities offered, but above all on clarity of use, perceived usefulness, operational reliability, and the ability of each tool to respond to concrete mobility-related situations in an understandable and credible way.

For Access Together, the main design priority should be the simplification of the reporting and participation experience. Participants consistently highlighted the importance of quick interactions, limited cognitive effort, and intuitive user flows. Access Together should therefore minimise the number of steps required to complete core actions, reduce unnecessary interface complexity, and ensure that the distinction between essential and optional inputs remains clear throughout the reporting process. The application should be designed as a lightweight participation tool capable of collecting both behavioural and experiential information without overburdening users. In this respect, ease of use is not merely a usability preference, but a necessary condition for sustained participation and meaningful data collection in pilot environments.



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The findings also indicate that trust is a central design dimension for Access Together. Users are more likely to engage if they perceive that their input is visible, meaningful, and linked to a credible follow-up logic. For this reason, the design should support transparent communication on how reports are received, stored, and processed, while clearly explaining the role of citizen contributions within the SmartUrbanity ecosystem. At the same time, the interface should avoid creating expectations that cannot yet be supported during the pilot phase. In particular, while workshop participants strongly valued report tracking, institutional routing, and visible administrative feedback, these functions depend on forms of interoperability and governance that are not yet fully operational within the current prototype scope. The recommended design approach is therefore to provide as much transparency as possible regarding contribution status and purpose, without promising fully integrated administrative case handling where this is not yet technically or institutionally feasible.

From an inclusiveness perspective, Access Together should be improved according to an accessibility-by-design logic. This means that the prototype should be optimised as far as possible in terms of readability, visual clarity, icon comprehension, reduction of interface overload, and simplicity of navigation. Particular attention should be given to those design choices that can reduce barriers for a broad range of users, including older adults, users with lower digital confidence, non-native speakers, and persons experiencing temporary or permanent mobility-related difficulties. With specific regard to users with visual impairments, the project should aim to optimise the interface during the pilot phase and use testing activities to identify the most critical barriers and future improvement priorities. However, advanced accessibility functions and formal compliance or certification pathways should be considered as part of later product maturation stages rather than as immediate pilot outputs.

For the Accessibility Analysis Platform, the workshops clearly point to the need for clarity, interpretability, and meaningful filtering options. Accessibility should not be represented only through abstract indicators, but through combinations of recognisable factors such as travel time, physical barriers, safety conditions, environmental comfort, destination-related facilities, and differentiated user situations. The platform should therefore privilege explanatory visualisations and filters based on concrete mobility conditions, such as travelling with a stroller, reduced walking capacity, specific route preferences, or different categories of services and destinations. This would make the outputs more understandable for both technical and non-technical users and would better reflect the lived experience of accessibility rather than a purely technical measurement.

At the same time, the design of the Accessibility Analysis Platform should remain proportionate to the maturity of the pilot. Several recommendations, such as extensive real-time updates, complex environmental layers, or broad integration with third-party infrastructures and external datasets, are relevant for the long-term evolution of the platform but should be treated as progressive extensions rather than immediate pilot requirements. Within the current phase, the design should favour stable, transparent,

and interpretable functionalities over technically ambitious features that would be difficult to validate or maintain consistently across pilot territories. In this sense, robustness and clarity should prevail over excessive feature expansion.

For the Decision Support System, the key design implication is the need to reconcile analytical complexity with operational readability. Decision-makers require tools that can take into account technical indicators, citizen-generated evidence, social equity considerations, and intervention-related constraints such as budget, urgency, and institutional competence. However, they also need outputs that are understandable and usable within real administrative workflows. The DSS should therefore be designed around explainable prioritisation logic, transparent scenario comparison, and progressively structured outputs capable of clarifying why one intervention is prioritised over another. Rather than overwhelming users with excessively dense dashboards or simultaneous multi-scenario comparisons, the system should present information in a gradual and interpretable way, supporting decision-making through clarity and traceability.

5.4. Next Steps

Building on the findings and recommendations of this deliverable, the next phase of SmartUrbanity will focus on progressively implementing and refining the WP3 digital ecosystem in alignment with the conceptual framework and the responsibilities of each partner. The next steps will therefore concern not only the improvement of individual tools, but also the consolidation of the full data-processing and analysis architecture linking user participation, spatial aggregation, modelling, and decision support.

For the citizen engagement layer, the next activities will focus on strengthening the interaction flows implemented through Access Together, Access Hub, and the survey modules. This includes improving the collection of behavioural, perceptual, and contextual data through app-based and web-based interfaces, while ensuring that inputs remain structured, lightweight, and coherent with the data requirements defined in WP2. Particular attention will be given to reporting flows, follow-up questionnaires, profile surveys, and participation mechanisms that support both inclusiveness and data consistency across pilots.

For the data architecture and processing logic, the next phase will focus on consolidating the shared structured contribution model and ensuring consistency between the User Database and the aggregated and anonymized Spatial Database. User-generated data will continue to be preserved as disaggregated and pseudonymized contributions, while the processing and aggregation layer will progressively transform these inputs into reproducible spatial entities, summaries, and indicators. This includes further specification of entity creation, matching, clustering, aggregation, and validation workflows for services, infrastructure, perceptions, issues, and desired interventions.



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For the participation governance and validation logic, the next steps will concern the operationalisation of contribution lifecycles and trust mechanisms. This includes the implementation of validation, voting, and verification processes that allow user contributions to evolve from individual submissions into collectively validated spatial evidence. These mechanisms are essential to support robust aggregation and to ensure that reported elements become analytically meaningful without losing traceability or reproducibility.

For the modelling components, future work will concentrate on calibration and validation activities using pilot-generated data. Surveys, behavioural traces, and user feedback collected through the engagement tools will support the progressive estimation of mobility profiles, perceived effort parameters, and local behavioural differences across pilot areas. These activities will strengthen the scientific robustness of SmartUrbanity models and improve their capacity to represent heterogeneous accessibility experiences.

For the analytical environment, particularly Access Atlas, the next development phase will focus on expanding the accessibility modelling framework and improving user interaction with the platform. This includes refining accessibility indicators, integrating contextual variables such as safety, environmental comfort, and affordability, and strengthening filtering options based on user profiles and situational constraints. Further work will also improve the clarity of dashboards, maps, and explanatory visualisations to ensure that outputs are understandable to both technical and non-technical users.

For the Decision Support System (DSS), the next steps will focus on progressively connecting aggregated evidence and analytical outputs to intervention-oriented workflows. This includes supporting the comparison of scenarios, the interpretation of accessibility impacts, and the use of structured spatial intelligence in policy-oriented analysis. In parallel, the interaction logic for future co-design and intervention evaluation flows will be further specified in coordination with the relevant work packages and pilot needs.

Across all components, an important next step will be to reinforce the interoperability of the WP3 ecosystem. Citizen-generated inputs, aggregated spatial intelligence, modelling outputs, and visualisation components should operate within one coherent architecture, where the same contribution can support participation, analysis, and decision support through different transformation layers. This integration is central to the SmartUrbanity approach and will guide the iterative refinement of the digital ecosystem during the pilot phase.

Finally, the next phase will continue to follow an iterative and phased implementation logic, in which testing, feedback, validation, and system refinement proceed together. Pilot deployment will therefore not only assess usability and technical performance, but also support the continuous improvement of the overall SmartUrbanity architecture



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as an integrated socio-technical system. This approach will support both short-term usability and long-term scalability.



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Appendix A: Usability Testing Questionnaire

Based on the screenshots, how easy does the account creation process appear to be?



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- ☐ Very difficult
- ☐ Difficult
- ☐ Neither easy nor difficult
- ☐ Easy
- ☐ Very easy

Based on the screenshots, how easy does the password reset process appear to be?

- ☐ Very difficult
- ☐ Difficult
- ☐ Neither easy nor difficult
- ☐ Easy
- ☐ Very easy

Based on the screenshots, are there any fields in the registration form that appear unclear or confusing?

☐ Yes ☐ No

Please specify:

Based on the screenshots, would you feel hesitant about providing any of the requested personal information (e.g., name, date of birth, etc)?

☐ Yes ☐ No

Please specify:

Based on the screenshots, do the permissions or access requested by the application (e.g., location, activity data, camera) appear reasonable and appropriate?

Based on the screenshots, how would you describe the overall interface layout?

- ☐ Very crowded
- ☐ Somewhat crowded

- ☐ Well-structured and clear
- ☐ Too simple

Based on the screenshots, does the application appear to support the mobility or activity modes you commonly use?

- ☐ Yes ☐ No ☐ Not sure

Based on the screenshots, how easy does it appear to be to track activities using the application?

- ☐ Very difficult
- ☐ Difficult
- ☐ Neither easy nor difficult
- ☐ Easy
- ☐ Very easy

Based on the screenshots, how easy does it appear to be to switch between mobility modes during the activity?

- ☐ Very difficult
- ☐ Difficult
- ☐ Neither easy nor difficult
- ☐ Easy
- ☐ Very easy

Based on the screenshots, do the presented results or impact summaries appear useful and easy to understand?

- ☐ Yes ☐ No ☐ Partially



Based on the screenshots, does the activity history appear detailed enough for your needs?

☐ Yes ☐ No ☐ Partially

How useful do you think this application would be for you?

☐ Not useful at all

☐ Slightly useful

☐ Moderately useful

☐ Very useful

☐ Extremely useful

Would you consider using this application if it were available?

☐ Definitely would not use it

☐ Probably would not use it

☐ Not sure

☐ Probably would use it

☐ Definitely would use it

Appendix B: Workshop findings

Table1: Regional workshops finding: Mobility Barriers

Workshop	Challenges
Rome Movesion	Private car dependency and public transport limitations: The Rome pilot is characterised by a strong dependence on private cars, compounded by the perception of public transport as infrequent and unreliable. Pedestrian infrastructure and accessibility barriers: The pedestrian network is considered inadequate, with

	accessibility further constrained by elevation changes and the widespread presence of stairways.
	Potential of accessible walking routes: Where accessible walking routes are available, they can significantly reduce pedestrian travel times.
Karlsruhe (KIT)	Accessibility: Many residents face difficulties navigating urban infrastructure due to physical barriers, including inaccessible public transport stops, buildings without barrier-free access, and inadequate pedestrian infrastructure.
	Safety: Participants highlighted issues such as poorly lit streets, conflict points between transport modes, and unsafe crossings.
	Limited information: Residents often lack reliable information about the quality and usability of mobility infrastructure, including path conditions, accessible routes, winter maintenance of cycling paths, and the availability of facilities such as ramps, bicycle parking, and e-bike charging stations.
Izmir (EGE)	Accessibility: Participants highlighted the need to improve accessibility, especially for vulnerable groups such as people with disabilities, wheelchair users, and parents with baby strollers. Barrier-free route continuity, curb heights, and accessible sidewalk transitions were identified as important concerns.
	Safety: Safety is considered an important issue for women and other vulnerable groups, particularly during evening hours.
)	Infrastructure and Accessibility Failures: A significant concern is the presence of non-functional accessibility features, such as broken lifts at major transport hubs, which directly impede movement for many citizens

	Security and Parking Concerns: Users highlighted safety risks and a lack of security in parking areas, alongside the persistent difficulty of finding available parking spots near their final destinations
	Service Reliability and Availability: Participants frequently encountered long waiting times and inconsistent public transport schedules. Furthermore, the unreliability of shared mobility resources such as bicycles was noted as a major barrier to seamless travel.
Thurgau (ZHAW)	Infrastructure is generally perceived as safe in suburban areas. There is instead a general perception of danger when using bike lanes in the urban environment (accidents between trams and bikers happen quite often). In general, Swiss cities already act like 15-minute cities. At least this is the perception Public transport is a facilitator and it is highly reliable both in urban and suburban areas. Challenges come from suburban areas where a lot of people live and public transport cannot be as dense as in urban areas. For this reason, these people use cars or other private motorised vehicles. On-Demand services are therefore rising to catch these people and shift them to public transport choices. In this view, the 15 min city concept here includes the time to reach a train station, which is, in Switzerland, usually the centre of multiple activities.

Table 2: Regional workshops recommendations Access Together Application

Workshop	Insight	Recommendation	Implication
	Participants showed a strong willingness to contribute civic-oriented data,	Include transparent feedback mechanisms such as report status tracking, responsible	The app should not function merely as a reporting interface, but as a trust-

Rome (Movision)	especially on everyday mobility and neighbourhood barriers, provided that their input produces visible effects.	office visibility, and notification of progress or resolution.	building participation tool linking citizen input to visible administrative follow-up, this implies more useful application
	Trust in the app depends on traceable feedback, including report status updates, visible outcomes, and clear case handling by the responsible authority.	Design the app around short and structured reporting flows, with quick submission options and the possibility to complete a report later.	The tool may improve civic engagement only if citizens perceive that their contributions are meaningful, acknowledged, and capable of influencing local action.
Karlsruhe (KIT)	Participants suggested that including the purpose of the trip would improve the quality of the collected data for further analysis.	Include the purpose of the trip in the activity tracking part.	
	To record the trip, the participant suggested starting a trip via a widget or smartwatch and enabling automatic trip detection.	Automatic trip detection.	Additional technical requirements for the citizens.
	Participants prefer that the trips can be recorded without an internet connection and uploaded later.	Temporal logging of activity information. Automated data upload when internet connectivity is available.	Alleviate the requirement for internet connectivity.

	The participants think that a mechanism to report the quality of the infrastructure would be useful.	The quality of infrastructure should be taken into consideration.	Align with citizens' needs.
	Users prefer to have a structured feedback mechanism that includes timely responses and notifications when issues are resolved, which was considered an important motivator for ongoing usage	The application could include a structured feedback mechanism.	Align with citizens' needs.
	Users prefer to have a clear view about the responsible for quality control and for moderating the submitted issues	The management of the reported issues should be transparent.	Improve the transparency of the application.
	Users think it would be useful for transport companies if issues were forwarded directly to the relevant parties (e.g., reporting damaged public transport stops to the local public transit authority)	Identification of responsible parties on infrastructures.	Reduce process time for the interventions.

	Users prefer to view other users' reported issues in the map to avoid duplication.	Collective visualisation of mobility reported barriers.	Make the application more informative.
	Participants prefer to have multilingual support and a simple, intuitive design that displays only the essential information and minimises battery consumption	The application should support English and local languages.	Align with the inclusivity requirement.
	To improve the inclusiveness of users under 18 years old and support visually impaired users, it was suggested that the app should be compatible with screen readers and offer the option to report issues via voice input.	The application should be adaptable to the needs of visually impaired users.	Align with the inclusivity requirement.
	Participants expressed an interest in visualising and analysing statistics on individual and overall mobility in Karlsruhe	The application should provide a regional visualisation of mobility summary statistics.	Align with citizens' preferences.

	Furthermore, the participants wanted the option of entering data without creating a user account.	Information such as the users' gender and age should be provided voluntarily, but the benefits should be clearly explained.	Align with citizens' preferences.
	Participants also emphasised the importance of avoiding redundant structures, such as functions that overlap with those of existing platforms.		Avoid having the same features used in existing platforms and focus on the added value compared to other solutions.
	For gamification, users suggested awarding points for useful issue reports, offering rewards for daily use, and enabling users to compare their progress with friends or other users.	The rewarding feature in the gamification should take into consideration the contribution of the users in terms of reported issues.	Improve user engagement.
	Allowing users to set a pin directly on the map would be more precise.	The application could provide the possibility to add a pin directly on the map.	Ease of use.
Izmir (EGE)	Users are interested in receiving feedback on the environmental impact of their mobility choices		

	Users expect personalised and practical mobility support within the app	Frequently used routes and transport modes should be saved.	
	Participants emphasised the importance of feedback after reporting issues.	Notifications should be sent when reported issues are resolved.	
	Users suggested personalised, health-related information within the app.	Features such as displaying high air pollution areas for sensitive users (e.g., individuals with asthma) should be provided.	
	Participants expressed interest in gamified features to motivate app usage.	Include game-based challenges offering rewards such as public transport or bicycle rental discounts.	
	Participants expect ease of use and accessible interfaces for people with disabilities.	Specialised features such as voice-command interfaces for visually impaired users should be provided.	
	Users expect the application to be fast	Participants indicated they would engage only if the	

)	and easy to use. To ensure and increase adoption, the reporting feature must be streamlined	reporting process could be completed within a short timeframe, such as a 5 to 10-second window.	
	Long-term user retention (incentivising repetitive use) is contingent upon the application's reliability and operational efficiency.	The application should ensure that the reported events and information are correct. The application should be operationally efficient.	
	The necessity of closed-loop communication, where users are proactively notified once their reported issues, such as barrier removals or infrastructure repairs, have been resolved	Include a feedback mechanism that informs the citizens about reported issues.	The citizens can perceive the usefulness of reporting issues, which gives incentives and motivation for reuse.
	Support multimodal transport options to be truly inclusive	Integration of multimodal transport.	Give citizens more realistic insights.
	Comprehensive tutorials and detailed documentation are needed to clarify the application's technical functions.	Include clear documentation.	Guiding the users by easy documentation can improve their engagement.
	Due to the abundance of similar tools, participants expressed confusion regarding which application to use for reporting mobility challenges, barriers and other issues.	The application must clearly demonstrate its added value compared to existing solutions to maximise user engagement.	The demonstration of the added value encourages citizens to install and use the application.

	Participants appreciate the scope of the application that broadens from merely reporting physical mobility barriers to capturing the perceived travel experience.	To engage the users, the development could focus on capturing the perceived travel experience.	
	Concerns regarding device resource consumption (specifically battery life) and data privacy.	The application should allow users to report events without the trip tracking feature.	Give more flexibility to the users and alleviate the concerns about data privacy.
Thurgau (ZHAW)	Participants want the app to be engaging and fun — through gamification, rewards, seasonal challenges, and AR — to motivate people to explore the city and use sustainable transport more often.	Add a reward system with points, daily challenges, and seasonal resets, where users can earn small prizes like public transport tickets by using the app regularly.	Gamification and rewards increase engagement but require ongoing maintenance, partnerships (e.g. SBB), and a clear budget — without this, the system may lose users over time.
	Personalisation and social features are seen as valuable, such as creating a profile for individual recommendations and discovering local community spots to meet neighbours.	Allow users to optionally create a profile to receive personalised route suggestions and discover nearby community spaces, while keeping profile creation non-mandatory.	Optional profiles improve personalisation but raise data privacy considerations that must be addressed carefully, especially under Swiss and EU regulations.
	The use of the app can be inappropriate, for example, it can foster behaviour like “be the first to post something”. Also, the contents of the pictures should be considered, e.g. if there are people	Continuous monitoring should be considered for inappropriate use.	This might lead to higher costs for managing the contents.

	injured due to an accident.		
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Table3: Regional workshops recommendations Accessibility Analysis Platform

Workshop	Insight	Recommendation	Implication
Rome (Movision)	The discussion on filters and profiles showed that accessibility should be represented through concrete mobility situations, such as age, strollers, walkers, wheelchairs, and other differentiated needs, while avoiding redundant categories.	Connect accessibility evidence with structured administrative workflows, including issue routing, office responsibility, and differentiated feedback processes	If properly designed, the platform can support more inclusive prioritisation by making invisible barriers, user differences, and action pathways more visible and actionable.
Karlsruhe (KIT)	The visualisation of public transport accessibility, including barrier-free (physical and perceived) access, was also emphasised primarily by citizens.	The application should provide information about barrier-free accessibility, especially to public transportation.	Align with the inclusiveness requirement.
	Transparency into the reasons for barrier-free routing.		Improve the transparency of the application.
	Participants proposed to include the attractiveness of walking or cycling routes.	The application should provide information about the attractiveness of road segments to active modes.	Encourage active mode usage.
	Functional aspects included costs of mobility options,	The application should take into consideration the	Improve resilience.

	shading, and climate or weather considerations and specific mobility requirements for children, such as sufficiently wide sidewalks and safe crossings.	weather and specific mobility requirements.	Align with user's needs.
	The evaluation of the path quality of the infrastructure and infrastructure at destinations needs to be provided (like bicycle parking facilities). Winter maintenance of cycle paths, the suitability of cycle paths for cargo bikes and charging facilities for e-bikes.		
	To define a user profile, participants suggest referring to age, gender, specific needs (e.g., travelling alone or with children), and user-defined walking speeds. The saving of the mobility profile was suggested.	The application should take into consideration demographic factors and social situations while defining the group of users.	Provide a better assessment for accessibility for each group of users.
	For the filtering feature: participants suggested to filter age groups, mobility impairments, temporary constraints such as carrying luggage, type of destinations, specific transport modes, street lighting, and the	The application should take into consideration demographic factors and social situations while defining the group of users.	Provide a better assessment for accessibility for each group of users.

	distinction between daily basis and non-daily basis destinations		
	Participants highly prioritised the mapping of traffic safety aspects, such as visibility, conflicts, accidents, street lighting issues and the presence of other people.	The application should take into consideration microscopic factors that can affect safety.	Align with users' needs.
Izmir (EGE)	Participants highlighted the need to identify critical infrastructure and internal accessibility conditions of facilities.	Allowing users to pin critical infrastructure and include information on internal accessibility (e.g., accessible restrooms)	
	Participants emphasised the importance of digital inclusivity for various user groups, such as colour-blind individuals.		
	Users suggested including filters for perceived safety and barrier-free routes.		
	Participants noted the use of data to identify areas with high concentrations of disabled or vulnerable groups.		
)	To assess accessibility, it is primordial to take into consideration the	The application should take into consideration safety and infrastructure.	Align with citizens' needs.

	safety of physical infrastructure, the security of the surrounding environment, and the safety of traffic conditions to ensure the protection of citizens		
	Participants highlighted the necessity of economic accessibility, emphasising the provision of affordable mobility options for all social groups.	The application should take into consideration economic accessibility.	Align with the inclusiveness objective.
	The accessibility of services is intrinsically linked to temporal efficiency, travel speed, and user comfort, even during periods of moderate weather.	The application should take into consideration comfort and weather aspects.	Align with the inclusiveness objective and citizens' needs.
	Decision-makers emphasized the importance of a well-defined strategic framework to target these diverse demographics, specifically identifying the pivotal role of local associations as intermediaries in reaching and engaging these priority groups.	Local associations can be solicited to engage citizens	Align with the inclusiveness objective. Allow to reach different social groups.
	Participants also stressed that the definition of "services" and "points of interest" needs to be clarified, as many citizens	Clearer explanations and practical examples would help users better understand what falls under each category and how these elements relate	Avoid an ambiguous understanding of the concepts.

	found these concepts difficult to grasp.	to their daily mobility experiences.	
	Participants underscored the practical utility of the application for citizens, particularly as a tool to inform housing decisions and relocation strategies based on personalised accessibility requirements.	The citizens prefer to have access to the analysis results (consultation mode)	Attract more users.
	Furthermore, participants expressed a strong interest in features such as accessibility heatmaps with possible advanced filtering by services, aspect and social groups.	Allowing access to accessibility heatmaps to citizens. The value of this feature depends on its reliability level and efficiency.	Attract more users.
Thurgau (ZHAW)	Participants want the map to be real-time and reliable, and to include detailed information such as road steepness, elevator locations, and weather conditions that may affect how people move around.	Add a crowd-reporting feature where users can report issues like construction sites, and others can confirm or reject them — similar to radar-based apps.	If the map data is not kept up to date, users will lose trust in the platform quickly, which can reduce participation and make the tool ineffective.

Table 4: Regional workshops recommendations for Decision Support System

Workshop	Insight	Recommendation	Implication
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Rome Movesion	Public offices already manage citizen inputs through multiple fragmented and non-integrated channels, creating duplication and a significant administrative workload.	Ensure interoperability with existing administrative and mobility platforms, and support explainable prioritisation processes.	The DSS has value only if it reduces fragmentation and helps administrations translate dispersed inputs into usable decision intelligence.
	Urban prioritisation is shaped not only by citizen demand but also by safety, regulation, budget constraints, and institutional competencies.	Combine objective data and subjective perceptions within a common analytical framework, so that lived experience can inform policy evaluation without replacing technical criteria.	A well-designed DSS could improve the legitimacy of urban decisions by making the relationship between evidence, constraints, and priorities more understandable to both institutions and citizens.
Karlsruhe (KIT)	All participants require is consideration of weather (temperature, rain, etc.) and climate conditions, as well as mobility behaviour and mobility perceptions.		
	Location and effects of street greening should be reflected in the DSS.		
	The participants also discussed the functionality to share potential measures with citizens and collect their		

	feedback in a participatory format.		
	The tool is very complex; therefore, making it easy to use can be difficult. The handling of citizen participation is difficult and will need strong moderation.		
	DSS may provide easier access to simpler indicators, enabling quick analysis of at least the direction of effects of certain measures.		
	The climate impact of measures can be assessed and visualised, which isn't the current practice.		
Izmir (EGE)	Participants expressed the importance of integrating citizen-generated data into decision-making, while noting challenges related to spatial data resolution (street vs. neighbourhood level)		

	Decision-makers stressed the limited municipal datasets, internal governance bottlenecks, and the lack of standardised procedures for data handling.		
	Participants suggested incorporating the social and demographic profile of the area into the analytical framework		
	Multimedia evidence can improve data validation and support more accurate decision-making		
)	To enhance the system's effectiveness, participants proposed the integration of multidimensional accessibility indicators, combining quantitative metrics such as the volume of cyclists per zone with qualitative user feedback. Specifically, mapping user comments was suggested as a method to capture the perceived travel experience.	The application can include traffic-related information and qualitative feedback from citizens.	Enhance the system's effectiveness

	From the point of view of decision-makers, it is important to align the DSS with real-world operational procedures for managing intervention requests.	The application should take into consideration the operational process used by decision makers	Align with the organisational requirements of the decision makers.
	The participants highlighted the importance of synthesising planned interventions with citizen-driven inputs to ensure the system remains reliable and efficient.	The application should provide a synthesis of both citizen inputs and decision makers' interventions.	Improve system reliability.
	It is important to evaluate infrastructure, such as sidewalks, against accessibility norms (e.g., standard width and height) to identify non-functional assets.	The application should include information about functional and non-functional infrastructures.	Aligns with citizens' needs. Improve reliability. Attract more users.
	It is crucial to include an economic and impact analysis: for example, cost-benefit analyses to define intervention strategies, with a specific focus on the urgency of the intervention and its projected effect on overall accessibility.	The application should provide insights into the impact of interventions and assess whether they are worth implementing.	Improve efficiency

	Establishing a clear hierarchy for interventions, supported by comprehensive explanations to justify why specific actions are prioritised over others.	The application should provide clear, understandable reasons for the selected intervention.	Enhance transparency.
	Participants emphasised the critical importance of platform reliability and the capacity to effectively report dynamic events such as traffic conditions and construction activities	Due to the large amount of dynamic data included, it is also important to guarantee the speed of reported information, reaction, and the scalability of the platform.	Align with scalability and efficiency requirements.
	Social inclusiveness	The platform must accommodate non-local language speakers through multilingual support.	Align with the inclusiveness objective.
Thurgau (ZHAW)	Participants agreed that simulation and visualisation tools are useful, but simplicity is key — presenting one solution at a time and showing results clearly is more effective than showing many options at once.	Results and processes should be visualised in real time, with a clean and simple interface that presents one variant at a time, supported by cost-benefit analysis.	Legal frameworks may slow down the adoption of decision support tools, so early engagement with regulatory bodies is important to avoid blockers later.