SEAMLESS SHARED URBAN MOBILITY

Demonstration & impact evaluation of Follower LLs

Project deliverable D4.3

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TABLE OF CONTENTS

Project Executive Summary

The objective of the SUM project is to transform current mobility networks towards innovative and novel shared mobility systems (NSM) integrated with public transport (PT) in more than 15 European Cities by 2026, reaching 30 by 2030. Intermodality, interconnectivity, sustainability, safety, and resilience are at the core of this innovation. The outcomes of the project offer affordable and reliable solutions considering the needs of all stakeholders such as end users, private companies, public urban authorities.

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Deliverable executive summary

The purpose of this deliverable is to provide a comprehensive overview of the implementation and evaluation of the Follower Living Labs within the SUM project, focusing on sustainable urban mobility in cities such as Krakow, Rotterdam, Coimbra, Fredrikstad, and Larnaca. Key objectives of the deliverable include summarizing the main activities, outcomes, and lessons learned from each Follower Living Lab, highlighting both successful approaches and challenges encountered in the integration of shared and on-demand mobility solutions with public transport systems.

By distilling these insights, the deliverable aims to inform evidence-based policy recommendations that can support the scaling and replication of effective mobility solutions, improve multimodal transport integration, and contribute to more sustainable and inclusive urban mobility systems. In particular, the findings provide valuable input for understanding how innovative mobility services can complement existing transport networks and respond to diverse local mobility needs.

Additionally, the deliverable facilitates knowledge sharing by serving as a reference for best practices, pilot experiences, and innovative mobility concepts tested across different urban contexts. This exchange of experience supports mutual learning between cities and stakeholders involved in urban mobility transformation and helps identify practical solutions that can be adapted to other environments.

Furthermore, the document contributes to future research and development by identifying remaining barriers, operational challenges, and areas requiring further investigation, particularly in relation to user adoption, service reliability, and long-term behavioral change. It also emphasizes the importance of stakeholder engagement, highlighting the role of cooperation between local authorities, transport operators, technology providers, and citizens in ensuring that mobility solutions are effective and user-oriented.

By compiling and analysing the results of the Follower Living Labs, this deliverable contributes to the broader discourse on sustainable urban mobility and supports the deployment of scalable, integrated, and user-centred shared mobility solutions across diverse urban contexts.

Krakow focused on the implementation and evaluation of an innovative demand-responsive transport (DRT) service, LajkBus, designed to improve accessibility and first- and last-mile connectivity in the peripheral district of Skotniki. The pilot introduced a digitally supported, flexible mobility service integrated with the existing public transport system, using a dedicated mobile application, virtual stops, ride-sharing, and algorithm-based demand management to optimise vehicle operations. Unlike traditional fixed-route services, LajkBus was designed as a flexible solution adapted to passengers' actual mobility needs, particularly supporting access to public transport hubs such as the Czerwone Maki Park & Ride interchange. The demonstration showed the potential of demand-responsive transport as a complementary solution to conventional public transport, especially in peripheral areas where travel demand is dispersed and regular services may be less efficient. The Living Lab generated valuable operational insights regarding service design, user acceptance, digital accessibility, integration with multimodal transport systems, and cooperation between public authorities, technology providers, and transport operators. Key lessons highlighted the importance of effective communication, seamless integration with existing mobility services, continuous monitoring of user needs, and appropriate organisational and operational frameworks to ensure the long-term sustainability and scalability of flexible mobility solutions.

Rotterdam developed and demonstrated an innovative multimodal journey planning solution by integrating a micromobility availability prediction model into the RET public transport app. Based on historical shared e-moped data and machine learning, the solution provides travellers with forecasts of vehicle availability to support first- and last-mile travel. Developed in collaboration with TU Delft, Siemens Mobility and the shared mobility provider CHECK, the pilot demonstrated the potential of predictive analytics to improve multimodal journey planning despite challenges related to data availability and limited cooperation from mobility providers. The Living Lab provided valuable insights into data-driven mobility services, multimodal integration, stakeholder collaboration and the importance of reliable data sharing for the future deployment of predictive mobility solutions.

Coimbra implemented a flexible passenger transport service integrated with the existing public transport network to improve first- and last-mile connectivity in a low-density peripheral area. The pilot combined a digital booking platform with a call centre, ensuring accessibility for digitally excluded and elderly users. While the demonstration increased awareness of demand-responsive mobility and generated valuable institutional learning, actual service uptake remained limited, highlighting the importance of sustained communication, service reliability, and user engagement. The Living Lab demonstrated that flexible transport can support more inclusive and integrated mobility systems, provided it is embedded within a broader multimodal strategy and supported by appropriate operational and policy frameworks.

Fredrikstad applied a co-creation approach to explore opportunities for more integrated and sustainable mobility solutions, with mobility hubs and the development of existing transport interchanges as important themes. The co-creation process was not only used to develop ideas and concepts, but also to ensure broad stakeholder involvement, capture diverse perspectives and identify opportunities beyond traditional organisational and sectoral frameworks. Through a series of workshops and collaborative activities, municipal departments, transport providers, citizens, researchers, and other stakeholders jointly explored how ferry services, public transport, active mobility, and shared mobility solutions could be better connected and integrated. The process resulted in concrete development ideas, strengthened collaboration across sectors and organisations, and valuable insights into how co-creation can support local ownership, innovation, and the development of user-centred mobility solutions. A key lesson from the Living Lab was the value of involving a broad range of stakeholders, including academia, public authorities, mobility providers and end users, to create a shared understanding of challenges and opportunities and support the development of transferable solutions for sustainable urban mobility.

Larnaca implemented and tested integrated and user-centred mobility solutions supporting the transition towards more sustainable urban transport. Key activities included the deployment of a MaaS platform integrating public transport and bike-sharing services, optimisation of public transport operations, expansion of the bike-sharing network, introduction of multimodal ticketing and incentives, and the implementation of complementary policy measures aligned with the city's SUMP. These interventions resulted in a significant shift towards sustainable mobility, with car dependency substantially reduced and increased adoption of public transport and active mobility modes. The Living Lab also improved service accessibility, convenience, and user satisfaction through continuous stakeholder engagement and data-driven decision-making. Overall, the Larnaca Living Lab demonstrated that combining digital innovation, integrated mobility services, and supportive policy measures can effectively accelerate the uptake of sustainable transport solutions.

1.1 Key words

This section presents the key terms and concepts that define the scope and focus of Deliverable. The selected keywords reflect the main themes addressed in the Follower Living Labs, including the integration of shared and on-demand mobility services with public transport systems, the use of digital tools, and the pursuit of more sustainable and inclusive urban mobility solutions.

They highlight the core dimensions of the demonstrations, such as multimodality, accessibility, user acceptance, and system-level innovation. Together, these keywords provide a structured overview of the main topics and support a clearer understanding of the objectives, activities, and results described in this deliverable.

Shared mobility; on-demand mobility; public transport integration; ferry-based mobility; Living Labs; intermodality; sustainable urban mobility; follower cities; municipal mobility planning; first/lastmile solutions; integrated ticketing systems; participatory planning / co-creation; stakeholder engagement; policy innovation; smart cities / smart urban mobility; pilot projects.

List of figures

List of tables

1 List of abbreviations and acronyms

Acronym	Meaning
ASAP	As Soon As Possible
AV	Autonomous Vehicle
B2B	Business-to-Business
B2C	Business-to-Consumer
BNG	Bypakke Nedre Glomma
CATI	Computer Assisted Telephone Interviewing
DRT	Demand Responsive Transport
EC	European Commission
EV	Electric Vehicle
F-15 Shuttle	Hyke F-15 Shuttle (electric passenger ferry)
FRVU	Fredrikstad Travel Behaviour Survey (FRVU21, FRVU22, FRVU24)
GA	Grant Agreement
GPS	Global Positioning System
Hyke	Hyke AS (Mobility provider)
KoM	Kick-off Meeting
KPI	Key Performance Indicator
LL	Living Lab
LRT	Light Rail Transit
MaaS	Mobility as a Service
MoT	Ministry of Transport
NORCE	Norwegian Research Centre
NSM	New Shared Mobility
P & R	Park and Ride
PT	Public Transport
R & D	Research and Development
SINTEF	SINTEF Research Institute
SUMP	Sustainable Urban Mobility Plan
WP	Work Package

2 Purpose of the deliverable

2.1 Attainment of the objectives and explanation of deviations

The purpose of this deliverable is to provide a comprehensive overview of the findings and insights gained from the Follower Living Labs focused on sustainable urban mobility in cities such as Krakow, Rotterdam, Coimbra, Fredrikstad, and Larnaca. This document serves as a reference for stakeholders, policymakers, and researchers to better understand how shared and on-demand mobility solutions can be adapted, integrated, and scaled in diverse urban contexts, particularly where such systems are less mature or require further optimisation.

The deliverable highlights how Follower cities build on and replicate solutions developed in Leader Living Labs, while addressing their own local challenges, including accessibility gaps, first- and last-mile connectivity, and dependence on private car use. It also reflects the role of digital tools, governance models, and user engagement in supporting more inclusive, efficient, and sustainable mobility systems.

The objectives related to this deliverable have been achieved in full and in accordance with the planned timeline, providing valuable insights into the transferability, scalability, and real-world performance of innovative mobility solutions across different types of cities.

Table 1 Deliverable Objectives

Role	Who
Summarizing Key Findings D4.3: To summarize the essential results and lessons learned from each Follower Living Lab, highlighting transferability of solutions, local adaptations, and areas for improvement in sustainable and shared mobility.	Follower LLs
Informing Policy Recommendations: To provide evidence-based recommendations for policymakers, focusing on the replication and scaling of shared and on-demand mobility solutions in diverse urban contexts.	WP4 – All Follower LLs contributed to Policy Recommendations (WP5)
Facilitating Knowledge Sharing: To serve as a resource for exchanging best practices, operational insights, and innovative approaches tested in follower cities, supporting capacity building and replication potential.	All Follower LLs contributed their best practices through demonstrations, Living Lab activities, workshops, and stakeholder engagement
Encouraging Stakeholder Engagement: To emphasize collaboration among municipalities, transport authorities, service providers, and local communities in implementing and adapting mobility solutions	Follower LLs
Replicability and Lessons Learned: To identify gaps, challenges, and success factors in implementing shared mobility solutions, and to support further research and scaling across cities with similar conditions.	Follower LLs

2.2 Intended audience

This document serves as a critical reference for stakeholders, policymakers, and researchers, enabling them to understand the effectiveness of integrated public transport systems and shared mobility solutions in addressing urban mobility challenges through measures implemented in several cities across Europe. The intended audience includes city administrations, private companies involved in mobility services, public urban authorities, and academic institutions, all of whom play a vital role in shaping the future of urban transportation. Overall, the report highlights the importance of a holistic, data-driven, and collaborative approach, which can be utilized by these stakeholders as a guide to best practices in sustainable mobility measures. By sharing successful best practices by implemented measures and innovative solutions from various European cities, the document aims to foster a deeper understanding of how shared mobility can complement existing transport systems, reduce congestion, and enhance accessibility for all citizens.

Furthermore, the insights and recommendations provided in this document are designed to inform decision-making processes, encourage innovative solutions, and promote the adoption of strategies that enhance the overall quality of urban mobility for all users. The report emphasizes the need for collaboration among different stakeholders, including local governments, transport operators, technology providers, and community organizations, to create a cohesive and efficient mobility ecosystem

3 Follower LLs

Chapter 3 presents the activities, experiences, and results of the Follower LLs within the project framework. It includes the local context of the participating cities, their objectives, implemented demonstration activities, data collection approaches, KPIs, and the main results achieved. The chapter also summarizes lessons learned, best practices, replicability potential, and overall conclusions from the implementation process. Due to the specific nature of the document and the diversity of local conditions, each Follower LL prepared its contribution independently. Therefore, the structure, level of detail, and style of presenting information may differ between cities, reflecting their individual approaches, priorities, and local contexts.

3.1 Follower LLs Context

3.1.1 Krakow

Krakow is the second largest city in Poland and the 9th biggest noncapital in EU. The heart of the city Old Town is a UNESCO World Heritage Site that attracts c.a. 15 million of visitors each year. Krakow also serves as a major academic, cultural, and economic hub, making efficient urban mobility an important aspect of its development.

The city's transport network consists primarily of trams and buses. Trams form the backbone of the system, providing fast and reliable connections between key districts and the city centre, while buses complement the network by serving areas not directly accessible by tram lines, as well as a feeder. Public transport is organized by the Zarząd Transportu Publicznego w Krakowie (PTA in Krakow).

In addition to traditional public transport, Krakow continues to invest in modern and sustainable mobility solutions. These include the development of fast tram routes, expansion of cycling infrastructure, and integration with regional rail services that connect the city with surrounding areas. Efforts are also being made to reduce car traffic in central districts and promote environmentally friendly modes of transport, reflecting broader goals of sustainable urban development.

Krakow is one of the Living Labs participating in the SUM project, aiming to transform urban mobility systems by integrating innovative shared mobility services with public transport. As a major urban centre in Poland, Krakow is characterised by high population density, significant commuter flows, and increasing transport demand.

Despite having a well-developed public transport network (tram and bus systems), the city faces several mobility challenges:

- high reliance on private cars- The results of the Comprehensive Traffic Survey for the Krakow Metropolitan Area (performed in 2023) confirm the continued strong dependence on private cars across the metropolitan region. Among non-pedestrian trips within the Krakow Metropolitan Area, the largest share is made by private cars (almost 50%), while public transport accounts for almost 45% of all trips. The data also revealed high traffic volumes on the main urban corridors and access roads, particularly during peak hours, highlighting the significant role of individual car transport in everyday mobility patterns throughout the agglomeration. These findings support the conclusions of the Krakow SUMP, which identifies the reduction of car dependency as one of the key challenges for sustainable urban mobility development in the metropolitan area,
- congestion in urban areas,
- limited accessibility of public transport in peripheral districts- The Krakow SUMP identifies improving accessibility to public transport as one of its core objectives, suggesting that accessibility problems still occur, particularly in peripheral districts and suburban municipalities of the metropolitan area,

89,4 % of Krakow's residents have access to trams and buses within 500 m walking distance, 46% of the residents of the Krakow Metropolitan Area assess their access to public transport as very good or good,

- need for better multimodal integration - The Krakow SUMP, stresses the importance of balanced development of all mobility modes and better coordination between public transport, cycling infrastructure, and pedestrian mobility.

Challenges are observed in suburban and low-density areas, where conventional public transport is difficult to operate efficiently due to dispersed demand and infrastructure constraints.

Prior to the implementation of the SUM demonstration, Krakow operated a Demand Responsive Transport (DRT) service called TeleBus. However, the system was relatively limited in comparison with modern on-demand mobility solutions. Introduced over 20 years ago, TeleBus relied on basic operational software and functioned more as a flexible bus service than a fully dynamic DRT system. Passengers primarily booked rides by phone, and the service operated within predefined zones and semi-fixed routes. The vehicles could only stop at the regular bus stops. Importantly, TeleBus did not use advanced passenger pooling or route optimization algorithms, meaning that vehicles were dispatched mainly based on whether demand existed rather than through real-time optimization of multiple passenger requests. As a result, the service offered limited flexibility, lower operational efficiency, and weaker integration with the broader public transport network. Passengers could book trips on the day of travel no later than 30 minutes before departure.

In contrast, LajkBus, planned to replace TeleBus in 2027, represents a significantly more advanced generation of on-demand shared mobility services. Unlike TeleBus, LajkBus is designed as a digitally integrated and algorithm-driven DRT platform. The new system is expected to rely primarily on mobile application-based booking, real-time demand management, and intelligent passenger pooling algorithms that dynamically optimize routes according to current travel requests. This allows vehicles to serve multiple passengers simultaneously while minimizing detours and waiting times. Compared to TeleBus, the system is also better adapted to the existing road network due to its higher operational flexibility. LajkBus does not require conventional fixed bus stops and can operate on lower-category or less accessible roads, enabling more efficient service provision in dispersed urban and suburban areas. The use of virtual stops allows vehicles to stop wherever it is safe for passenger boarding and alighting. Furthermore, the service was designed to support immediate or near-immediate trip requests, enabling users to order rides “on demand” without the need for long advance booking times.

Another major difference is the level of multimodal integration. While TeleBus operated largely as a standalone service, LajkBus is intended to become part of Krakow’s broader sustainable mobility ecosystem, better integrated with tram, bus, and metropolitan rail services. The redesigned system also aims to improve accessibility in peripheral districts and low-density areas where conventional fixed-route public transport is less efficient.

Therefore, the transition from TeleBus to LajkBus illustrates the shift from a traditional, manually coordinated demand-based bus operation toward a modern Mobility-as-a-Service (MaaS) oriented DRT model based on digitalization, automation, flexibility, and multimodal integration.

The activities implemented in Krakow are aligned with broader urban mobility policies, including:

- the introduction of a Low Emission Zone (LEZ) in 2026,
- SUMP implementation,
- change of paid parking rules including fee increase,
- public transport development plans (including metro),
- promotion of sustainable and shared mobility solutions.

3.1.2 Rotterdam

The Rotterdam Living Lab is a follower-type, large-city test environment characterised by mature public transport, widespread shared mobility, and strong digital readiness, but also by spatial inequalities, first/last-mile challenges, and user diversity. For example most of the shared mobility offer is located in and around the city center, there where public transport is also widely available. Connecting the shared mobility offer to the more sub-urban areas of the city and the outskirts of the public transport network would benefit more, and more diverse groups. Its context shifts the focus from introducing shared mobility to making it reliable, predictable, inclusive, and seamlessly integrated with public transport, particularly in peri-urban and areas with mobility poverty.

Rotterdam represents a large, dense, multimodal European port city with a well-developed public transport system, a high baseline availability of micro- and shared mobility services supported by a strong digital infrastructure and active MaaS-ecosystem. Still persistent challenges related to congestion, space allocation and care use occur. The relation between the City of Rotterdam and the RET is well aligned, the City of Rotterdam holds 99% of the shares of RET.

The city therefore provides a context where shared mobility is already present, but where system-level integration and reliability remain the key barriers rather than basic availability.

Around 2017–2019, shared mobility expanded rapidly with the introduction of shared bicycles and, especially, shared e-scooters, driven by technological innovation (apps, GPS, cashless payment) and broader policy goals related to accessibility, sustainability and reducing private car ownership. In 2020, Rotterdam became the first major Dutch city to introduce a permit system for shared two-wheelers, marking the start of active municipal steering of shared mobility in terms of scale, distribution, and nuisance control. By 2023, Rotterdam had 6,700–7,000 shared vehicles in operation. This included 3,000 shared e-scooters, 2,500 shared bicycles, five hundred shared cargo bikes, and around seven hundred shared cars. Usage grew significantly, with millions of kilometres travelled annually and hundreds of thousands of trips made, particularly with shared two-wheelers.

The RET (Rotterdam's public transport operator) does not operate shared vehicles itself but plays an important system-level role. Shared mobility is viewed by the municipality and the RET as a complement to public transport, particularly for solving the first- and last-mile problem. Shared bikes and e-scooters are therefore concentrated around public transport hubs, metro stations, and transfer points, extending the reach of metro, tram, and bus services. This aligns with Rotterdam's broader mobility strategy, in which public transport, walking, cycling and shared mobility together form an integrated mobility network.

3.1.3 Coimbra

The municipality of Coimbra located in central Portugal, within the Intermunicipal Community of the Coimbra Region (CIM|RC), it is the largest urban center in the region. It has a population of 140,816 inhabitants (Census 2021), with a seasonal population reaching approximately 200,000 residents. Covering an area of 319.4 km², Coimbra plays a key role as a regional hub and ranks among the main urban centers in Portugal.

The territory is characterized by significant topographical contrasts, with higher elevations in the eastern areas (above 300 m) and flat lowlands in the west associated with the Mondego River. Despite the presence of flat areas, the historic urban core is marked by steep slopes, posing constraints to accessibility, walkability, and inclusive mobility.

Coimbra presents a diversified and spatially uneven urban structure, combining a dense central core with peri-urban and low-density peripheral areas. These patterns contribute to uneven accessibility to services and public transport, with “white spots” ”, i.e., areas insufficiently served by public transport, where the distance to the nearest stop typically exceeds 600 meters and limits pedestrian access to the network.

The municipality is a major institutional and service hub, particularly in education and healthcare, hosting key infrastructures such as the University of Coimbra and the Centro Hospitalar e Universitário de Coimbra. This concentration of functions generates significant daily commuting flows, with Coimbra acting as a net attractor (entry/exit ratio of approximately 3.5).

In terms of mobility, Coimbra is a strategic national transport node, served by Linha do Norte railway and major road corridors such as the A1, while also functioning as a hub for interregional and international bus services.

However, the current modal split highlights a strong dependence on private cars, which account for approximately 70 % of trips, compared to 17 % for public transport, and 11 % for active modes (predominantly walking, with cycling remaining residual). This reflects structural challenges, including urban sprawl, increasing motorization rates, and limited integration between transport systems.

To address these challenges, Coimbra is investing in sustainable mobility solutions, including the implementation of the first Bus Rapid Transit (BRT) system in Portugal (Sistema de Mobilidade do Mondego) and the restructuring of the municipal public transport network. The municipality aims to significantly shift the modal split by reducing car dependency and increasing the combined share of public transport, NSM, and active modes to 56%, in line with European decarbonization and urban mobility goals.

Another challenge lies in addressing the territorial asymmetries within the municipality in mobility planning. While higher-density areas justify investment in structured, high-frequency transport networks, low-density territories may benefit demand-responsive transport models, ensuring solutions tailored to the local characteristics and population needs.

The parish of Cernache is located in the southern sector of the municipality of Coimbra, forming part of the transition zone between the consolidated urban area of the city and predominantly rural territories. It is situated approximately 10 km from Coimbra’s urban centre.

Cernache has a moderately sized population (3,962) distributed across several settlements and residential clusters, combining more concentrated development areas with dispersed building patterns. In recent decades, Cernache has experienced some residential pressure associated with its proximity to the city, partly functioning as a residential area for the working population employed in the city’s urban centre.

The parish is characterised by gently undulating terrain, with moderate elevations and no significant slopes. The territory features shallow valleys and small watercourses, mostly within the Mondego river basin. This morphology favours human settlement and agricultural use, with urbanised areas coexisting alongside agricultural and forested landscapes.

Until recently, Cernache was served by the municipal public transport network, operated by the Serviços Municipalizados de Transportes Urbanos de Coimbra (SMTUC), as well as by the intermunicipal and inter-regional network of CIM|RC. SMTUC operated two local routes (201 and 203), which fed into routes connecting to the urban centre (49/49T and 47/47F), with services running daily during peak periods and at lunchtime. Demand on the local routes was low, and buses operated mostly empty.

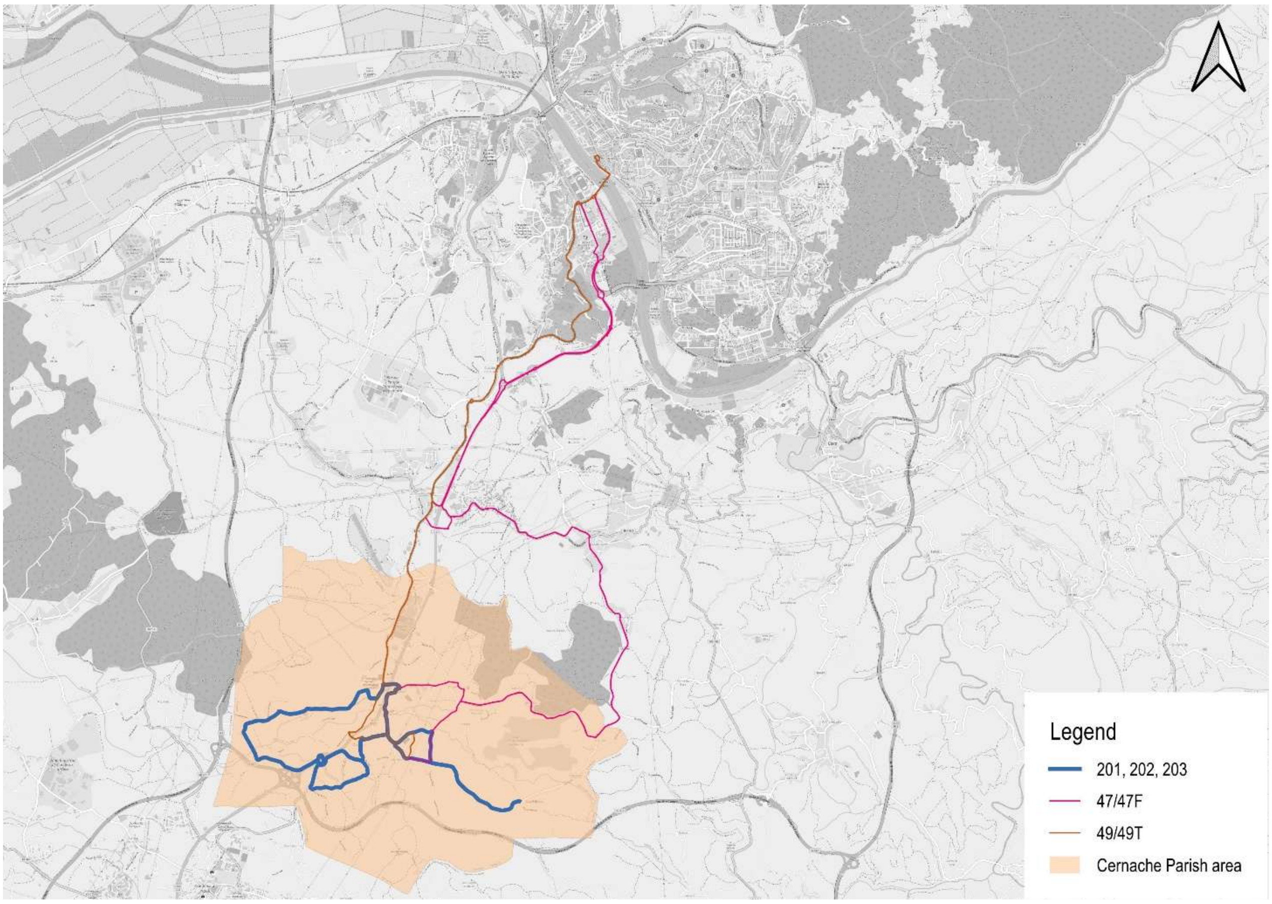


Figure 1 Public Transport Network in Cernache (Coimbra)

Coimbra Living Lab is strongly aligned with local and regional mobility policy frameworks. At municipal level, the Municipality of Coimbra is currently developing its Sustainable Urban Mobility Plan (SUMP). The first two phases of the process have been concluded, and the plan is now in its third phase (Strategy Development and Action Planning), focusing on defining a long-term vision, mobility scenarios and strategic objectives, as well as selecting concrete measures (including infrastructure, services and regulatory instruments) and establishing implementation timelines and budgets.

This strategic process is complemented at regional level by the Coimbra Region Sustainable Urban Mobility Action Plan (PAMUS), which promotes low-carbon, multimodal and inclusive mobility and explicitly supports the integration of innovative public transport services to reduce car dependency and improve accessibility across urban and peri-urban areas.

3.1.4 Fredrikstad

Urban, mobility, and socioeconomic context (ref. Grant Agreement)

Fredrikstad is a medium-sized city in south-eastern Norway, characterised by a compact urban centre, surrounding suburban areas, and strong functional integration with neighbouring municipalities. The city is divided by a major river and exhibits substantial regional commuting flows, resulting in a mobility system that combines urban, inter-urban, and regional travel patterns. Socioeconomically, Fredrikstad represents a typical Nordic medium-sized city context, with diverse residential areas, a strong public sector presence, and an increasing focus on innovation, sustainability, and inclusive development.

In line with the Grant Agreement, Fredrikstad was included as a Follower Living Lab to demonstrate how novel shared mobility systems can be adapted and implemented in cities with limited prior deployment of integrated shared mobility solutions, and where public authorities play a key role in enabling, coordinating, and anchoring local mobility initiatives.

Existing mobility challenges

Key mobility challenges in Fredrikstad include a high reliance on private car use for daily travel, particularly for commuting and cross-river trips. This contributes to congestion during peak hours and increased pressure on the road network. Although public transport services are well established, they face limitations related to flexibility, coverage, and the quality of first- and last-mile connections in certain areas.
Geographical barriers, particularly the river and waterfront areas, reduce network connectivity and limit the effectiveness of traditional land-based transport solutions. These challenges highlight the need for complementary and innovative mobility services that can improve accessibility while reducing car dependency.

Baseline situation prior to the demonstration

Prior to the SUM demonstration, shared and on-demand mobility services in Fredrikstad were limited in scale and operated as standalone or pilot-based initiatives. Integration with the existing public transport system was low, both technically and organisationally, and the use of shared mobility services was not widespread among the general population.
The baseline situation was also characterised by limited availability of structured local mobility data related to shared and on-demand services, constraining the municipality's ability to systematically analyse mobility patterns, user behaviour, and the potential impacts of innovative mobility measures.

Alignment with local and regional mobility strategies

The Fredrikstad Follower Living Lab is aligned with local and regional strategies aimed at reducing greenhouse gas emissions, promoting sustainable transport modes, and improving accessibility for all user groups. Municipal climate and mobility plans emphasise reduced private car use, increased use of public and shared transport, and the testing of innovative mobility solutions through pilot projects and Living Lab approaches.
In addition, the Living Lab is aligned with ongoing municipal mobility planning processes, including the development of a local Sustainable Urban Mobility Plan (SUMP) framework and the adopted street network and street use planning. These planning instruments prioritise walking, cycling and public transport through the allocation and management of street space and provide a strategic and operational framework for improving intermodality, transfer quality and the integration of shared and on-demand mobility with public transport.

The demonstration activities support these strategic objectives by generating practical experience, data, and lessons learned related to the planning, implementation, and governance of shared and on-demand mobility systems under real-world municipal conditions. In this way, the Living Lab contributes to knowledge-based policy development and supports long-term sustainable mobility transitions at the local level.

3.1.5 Larnaca

The Larnaca Living Lab is implemented in the third largest urban area of Cyprus, covering the city of Larnaca and its wider functional area. The area spans approximately 148 km² and has a population of around 103,000 inhabitants, characterised by strong functional links between the city centre and the surrounding urban zones. This interconnected structure supports a range of mobility needs, including commuting, access to services, leisure activities, and tourism. In addition, Larnaca hosts Cyprus's primary international airport, which handles several million passengers annually, further increasing travel demand and reinforcing the importance of efficient and integrated mobility solutions. Within this context, mobility is marked by a high reliance on private cars and an increasing need for more sustainable, efficient, and integrated transport systems.

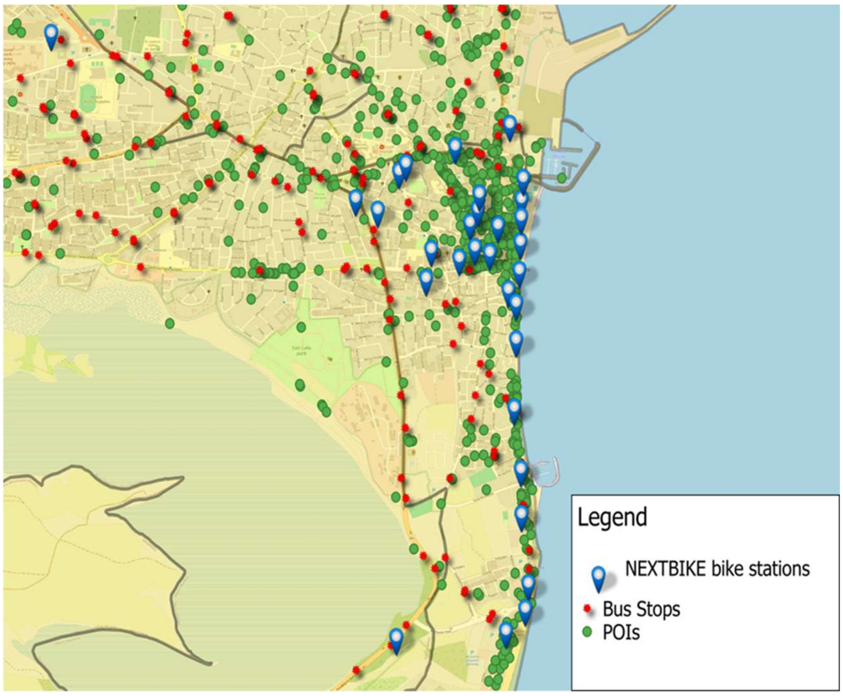


Figure 2 Larnaca Living Lab map.

Larnaca's mobility in the area is predominantly based on road transport, while public transport and emerging shared mobility services were less developed and not fully integrated. This reflects broader challenges addressed by the SUM project, which sought to transform the urban mobility systems by enhancing the integration of new shared mobility services with public transport. In this context, the focus was placed on enabling seamless and user-centric mobility solutions, improving intermodality, and strengthening connectivity between different transport modes. Furthermore, the approach supports the transition towards more sustainable, efficient, and resilient urban mobility systems, in line with the project's objectives of promoting accessibility, reducing car dependency, and improving overall travel experience for users.

Before the implementation of the Living Lab, several key mobility challenges were identified, including a high level of reliance on private car use and limited adoption of multimodal transport solutions. In addition, there was a fragmentation between public transport and emerging shared mobility services, alongside a lack of integrated ticketing and real-time information across transport modes. Public transport services also required improvements in attractiveness and service frequency, while awareness and uptake of sustainable mobility options remained relatively low. Overall, these conditions highlighted the need for integrated, user-centric solutions to support behavioural change and enable more seamless, sustainable, and multimodal urban mobility.

Prior to the Living Lab implementation, mobility services in Larnaca operated as separate systems, with no integration between public transport and any shared mobility solutions. Public transport was primarily based on bus services, while shared mobility options were limited to ride-hailing (e.g. Bolt) and traditional taxis. Bikesharing services were practically non-existent in the public realm; a small number of shared bikes existed, but only within private entities such as hotels, rather than being publicly available on the streets. The

MaaS concept was not available in the city, and its development was initiated within the project to enable integrated journey planning and ticketing across transport modes.

The Living Lab is closely aligned with local and regional mobility strategies, particularly the Larnaca SUMP. The implemented measures directly support key SUMP objectives, including reducing congestion, parking restrictions, promoting public transport use, encouraging active mobility, and improving environmental performance through integrated solutions such as bus and bike services.

In addition, the Living Lab contributes to broader policy priorities by ensuring that key interventions, such as the development of Park and Ride facilities and infrastructure improvements, including the ongoing construction of bus and bike lanes, are embedded within long-term urban mobility planning and implementation frameworks. This approach supports the coordinated implementation of sustainable mobility measures and strengthens their long-term impact within the city's transport system.

3.2 Objectives of the Follower LLs

In composing the set of living labs, SUM carefully selected the 9 living lab cities to ensure a diversity in the challenges that will be addressed and a variety of circumstances in which those are embedded.

3.2.1 Krakow

The Krakow Metropolitan Area Living Lab aims to address increasing transport and environmental challenges by promoting a shift away from car dependency toward more sustainable mobility options. Its objectives focus on reducing the share of car trips while increasing the use of public transport, cycling, and other alternative modes. A key priority is improving air quality by lowering emissions from road traffic, alongside making public transport more attractive and reversing its declining usage. It supports the expansion of shared and innovative mobility services such as bike sharing, e-scooters, car sharing, and demand-responsive transport. Key goal was to address accessibility gaps in peripheral areas where access to public transport remains limited.

In more detailed description, the main objective of the Krakow Living Lab was to design, implement, and evaluate an on-demand shared mobility service (LajkBus) integrated with the public transport system. The name LajkBus was selected during the project development process and was intended to create a strong local identity for the service. It refers both to the existing service LajkBike and to the Lajkonik, one of the most recognizable symbols of Krakow, thereby linking the new mobility solution with the city's cultural identity and existing sustainable transport initiatives.

The specific objectives included:

- improving accessibility of public transport in underserved areas,
- enhancing first- and last-mile connectivity,
- increasing the attractiveness and usage of public transport,
- reducing reliance on private cars,
- testing an operational model for scalable DRT services,
- increasing user acceptance of shared mobility solutions.

The target groups included:

- residents of the Living Lab area - approximately 6,500 inhabitants living within the designated Living Lab zone in the western part of Krakow, particularly in areas characterized by lower public transport accessibility and lower-density residential development,

- public transport users - passengers using public transport services connected to the Living Lab area and the Czerwone Maki transport hub, including users of tram, bus, and feeder mobility services integrated with the local transport system,
- commuters travelling to the Czerwone Maki transport hub - daily travelers commuting between peripheral districts, suburban municipalities, and the Czerwone Maki interchange, which functions as one of Krakow's major multimodal transport nodes linking tram, bus, P&R, and regional mobility services,
- former private car users - individuals travelling within the Living Lab area or commuting to/from the Czerwone Maki hub who are expected to shift from private car use to shared and public transport services as a result of the new mobility solutions introduced under the project.

Overall, the primary geographical focus of the target groups is the Living Lab area and its functional connections with the Czerwone Maki transport hub, while some impacts may also extend to the wider Krakow Metropolitan Area through improved multimodal integration and commuter accessibility.

The demonstration contributes to the development of a more flexible, inclusive, and sustainable urban mobility system.

3.2.2 Rotterdam

The challenge of the Rotterdam Living Lab:

1. Improve multimodal journey planning by integrating predictions of micro-mobility availability into MaaS travel planners.
2. Support seamless first/last-mile integration between public transport and new/shared mobility.
3. Address demand–supply imbalances in micro-mobility through predictive, data-driven tools.
4. Reduce car dependency and congestion in selected Rotterdam areas by making NSM+PT more competitive.
5. Assess scalable, replicable digital solutions that can be reused by other cities and MaaS providers.

Introduction of a forecasting model in the RET travel planner app that predicts the availability of a shared e-moped, up to 90 min before arrival. This new functionality will improve multimodal journey planning, support seamless first/lastmile options and address demand and supply of micromobility.

The functionality will be available for all RET app users. The introduction of the model will help to lower the barriers for the use of Public Transport in combination with new shared mobility services. Overall, the model/ functionality will be a piece of a bigger puzzle in creating more trustworthy and a more seamless alternative for travelling by private car.

3.2.3 Coimbra

The overall objective of the Coimbra Living Lab was to design, implement, and test a demand-responsive transport service in a peripheral area with limited accessibility to conventional public transport. The initiative aimed to enhance first- and last-mile connectivity, improve access to the public transport network, and attract new users, while optimizing operational resources and increasing cost-effectiveness.

A complementary objective was to develop and deploy a digital platform to support the operation of the demand-responsive transport service, including a call center component to ensure accessibility to elderly and digital excluded users. Through this approach, the Living Lab sought to assess the potential of digital tools for service booking, routing and operational optimization, while guaranteeing inclusive access for users with limited digital skills.

Additional objectives focused on enhancing accessibility, comfort, safety, and intermodal connectivity within the public transport system. This included improving pedestrian access to stops and stations, strengthening integration between different modes through well-designed mobility nodes, and upgrading waiting environments. Together, these actions aimed to improve user experience, increase perceived safety and convenience, and ultimately boost the attractiveness and usability of public transport.

The target user groups included residents in low-density areas, the elderly population, individuals without access to private vehicles, and users with limited digital skills. The demand-responsive transport service was specifically designed to support vulnerable groups by improving access to essential services and strengthening connections to the city center.

Key stakeholders involved in the Living Lab included:

- Municipality of Coimbra, acting as transport authority.
- SMTUC, as the public transport operator and provider of the new shared mode.
- Technology providers responsible for the digital platform.
- SUM project partners supporting methodological development.
- The local population, participating as users and contributors through surveys and interviews.

The Coimbra Living Lab contributes to sustainable mobility by introducing a demand-responsive transport service fully integrated with the existing public transport network. By enhancing accessibility without the need for additional fixed routes, the solution supports more efficient use of resources and reduces unnecessary vehicle circulation. Integration with conventional public transport strengthens intermodality and enables seamless door-to-door mobility chains. Furthermore, the provision of both digital and call center booking options ensures inclusive access for all users, particularly elderly and digitally excluded groups, thereby reinforcing the social dimension of sustainable mobility.

3.2.4 Fredrikstad

Overall objective

The overall objective of the Fredrikstad Follower Living Lab was to demonstrate how novel shared and on-demand mobility systems can complement existing public transport services and contribute to more sustainable, seamless, and inclusive urban mobility. In line with the Grant Agreement, the Living Lab aimed to test and adapt solutions developed in other SUM cities to a local context with limited prior experience of integrated shared mobility systems, while strengthening the role of public authorities in enabling and coordinating such initiatives.

Specific objectives of the demonstration

The specific objectives of the demonstration in Fredrikstad were to:

- test shared and on-demand mobility solutions as complementary services to the existing public transport system;
- improve first- and last-mile connectivity, with particular attention to cross-river and waterfront trips supported by the ferry-based pilot (Hyke F-15 Shuttle);
- increase awareness, understanding, and acceptance of shared mobility solutions among users and local stakeholders;
- generate practical knowledge and data to support local decision-making and future mobility planning.

Target user groups and stakeholders

The primary target groups of the Fredrikstad demonstration included daily commuters, residents in areas with limited public transport connectivity, and users with specific accessibility needs. Key stakeholders involved in the Living Lab included the municipality, public transport authorities, shared mobility service providers, technology partners, and other relevant local and regional actors. Collaboration between these stakeholders was essential to ensure coordinated implementation, operational learning, and alignment with local strategies.

Contribution to sustainable, seamless shared and urban mobility

Through the demonstration activities, the Fredrikstad Follower Living Lab contributed to the SUM project's objectives by providing evidence on how shared and on-demand mobility services can support a transition towards more sustainable urban mobility systems. The Living Lab generated implementation-relevant insights into governance arrangements, integration with public transport, and user-related aspects, supporting the development of scalable and transferable shared mobility solutions applicable to similar medium-sized cities.

3.2.5 Larnaca

The Larnaca Living Lab aimed to contribute to the overall objectives of the SUM project by demonstrating and evaluating integrated solutions for seamless, shared, and sustainable urban mobility, with a focus on reducing reliance on private cars and promoting multimodal transport systems.

The Larnaca Living Lab aimed to support the transition towards efficient, low-emission, and user-centric mobility systems by integrating new mobility services with public transport and facilitating behavioral change towards sustainable travel options. More specifically, it contributes to the overall objectives of the SUM project, which focuses on transforming existing urban mobility systems through the integration of new shared mobility with public transport, enhancing intermodality, and promoting seamless travel experiences across different transport modes.

Within this framework, the Larnaca Living Lab supports these objectives by implementing MaaS-based solutions that enable integrated journey planning, ticketing, and real-time information, while introducing and scaling shared mobility services such as bikesharing. These actions contribute to reducing car dependency, improving accessibility and connectivity, and enhancing the overall user experience. Furthermore, through the combination of technological innovation, operational improvements, and policy measures, the Living Lab aligns with the project's broader goals of promoting sustainable, resilient, and inclusive urban mobility systems.

The demonstration aimed to connect public transport and shared mobility services using a MaaS platform, allowing users to plan trips, purchase combined tickets, and access real-time information seamlessly. It also aimed to improve the attractiveness and efficiency of public transport services, including the optimisation of service frequency to better match demand. In parallel, the Living Lab supported the expansion of shared mobility services, particularly through the development of the bike-sharing network, enhancing first- and last-mile connectivity. Furthermore, the demonstration sought to encourage behavioural change by introducing incentive-based mechanisms, such as integrated ticketing and pricing strategies that promote multimodal journeys. Finally, it contributed to data-driven decision-making by leveraging digital tools, simulations, and user surveys to assess system performance, monitor impacts, and support the continuous improvement of mobility services.

The Living Lab targeted a wide range of users, including public transport passengers, daily commuters, leisure travellers, and visitors, aiming to improve their mobility experience through integrated and user-friendly services. Focus was placed on users who rely on private cars for their daily travel, intending to encourage a shift towards more sustainable transport options. The solutions were also designed to support users with diverse mobility needs, including last-mile connectivity, offering increased flexibility and convenience through the combination of bus and bike services.

Moreover, the Living Lab addressed both regular users, such as residents and workers, and occasional users, including tourists, who benefit from accessible, multilingual, and easy-to-use mobility services. By improving journey planning and ticketing through the MaaS platform, the demonstration aimed to enhance accessibility, usability, and overall user satisfaction across different user groups.

The implementation involved collaboration with key stakeholders, including public transport operators, shared mobility providers, MaaS developers, and data analysis partners, supported by local and national authorities, ensuring the effective delivery and coordination of the measures.

Contribution to sustainable, seamless shared and urban mobility

The Living Lab contributes to sustainable urban mobility by promoting multimodal integration, improving accessibility to alternative transport modes, and supporting a shift from private car use to public and shared transport. By utilising the MaaS platform, users adopt more flexible and efficient multimodal travel behaviours.

In addition, the combination of digital tools, service enhancements, and supportive policy measures improves the overall connectivity and usability of the transport system, making sustainable options more attractive. This contributes to reducing congestion, lowering environmental impacts such as emissions, and enhancing the overall travel experience. Furthermore, by supporting behavioural change and introducing user-centric mobility solutions, the Living Lab strengthens the transition towards more inclusive, efficient, and resilient urban mobility systems.

3.3 Description of the Demonstration

3.3.1 Krakow

Description of the shared mobility measures tested / implemented

The LajkBus demonstration is a pilot shared mobility service based on a DRT model. The system enables users to order rides via a dedicated mobile application, allowing flexible travel within a defined service area. Unlike traditional fixed-route buses, LajkBus operates dynamically, adjusting routes based on real-time passenger requests.

The service is implemented using smaller vehicles, which allows operation on narrow or less accessible streets where standard public transport buses cannot operate. This significantly improves accessibility in areas with limited transport coverage. The service is operated by two vehicles, with efficiency being a key priority in its design and operation.

Users can select both pick-up and drop-off points from a set of designated virtual stops within the service area, ensuring a structured but flexible system. These virtual points are digitally defined locations rather than traditional fixed bus stops, allowing the service to optimize routes while maintaining convenient passenger access. In addition, the use of virtual stops significantly reduces infrastructure requirements, as there is no need to construct or maintain conventional bus stop facilities. In practice, virtual stops can be established in almost any location where a vehicle can safely stop for passenger boarding and alighting, which increases operational flexibility and enables broader service coverage, particularly in areas with limited transport infrastructure.

Figure 3 LajkBus area (Krakow) *Figure 4 LajkBus fleet (Krakow)*

A key feature of the demonstration is ride pooling. The system combines multiple passenger requests into a single trip when routes overlap, optimizing vehicle usage and reducing operational costs. Algorithms dynamically adjust routes to accommodate multiple users, improving efficiency while maintaining acceptable travel times. The system also takes into account several service quality constraints, including:

- maximum pickup deviation,
- maximum dropoff deviation,
- maximum ride time, defined as the maximum amount of time a passenger may spend in the vehicle, including any additional travel time caused by ride pooling.

These parameters were tuned during the operation of the LajkBus service.

The service is designed primarily as a first- and last-mile solution, addressing gaps in the existing public transport network and improving overall accessibility for residents.

Integration with public transport

LajkBus is functionally integrated with the public transport system in Krakow. The service enables passengers to travel within the Skotniki area and connect to the main transport network at the Czerwone Maki P+R interchange hub.

At this location, users can transfer to regular buses and tram lines, continuing their journey across the city. This makes LajkBus an effective feeder service rather than a standalone transport mode. The majority of trips are oriented toward this interchange point, highlighting its importance as a mobility node.

Importantly, LajkBus operates under the same ticketing rules as the Krakow public transport system (KMK). Passengers are required to hold a valid KMK ticket or travel entitlement, meaning no separate fare system has been introduced. This simplifies usage and ensures consistency with existing public transport services.

Figure 5 Multimodal hub Czerwone Maki (Krakow)

Technological components and digital tools

The operation of LajkBus relies heavily on digital technologies. The core element is a dedicated mobile application, which serves as the primary interface for users. Through the app, passengers can:

- select pick-up and drop-off locations,
- choose departure or arrival times,
- book and manage rides.

The system uses real-time data processing and routing algorithms to match passenger requests and optimize vehicle routes. This includes dynamic scheduling, where routes are continuously updated as new bookings are made. The application also suggests the nearest available meeting point if the exact requested location is not accessible by vehicle.

Additional technological components include GPS-based vehicle tracking, backend systems for fleet management, and data analytics tools used to monitor service performance and demand patterns. The integration of these technologies allows for efficient coordination of vehicles and improved user experience.

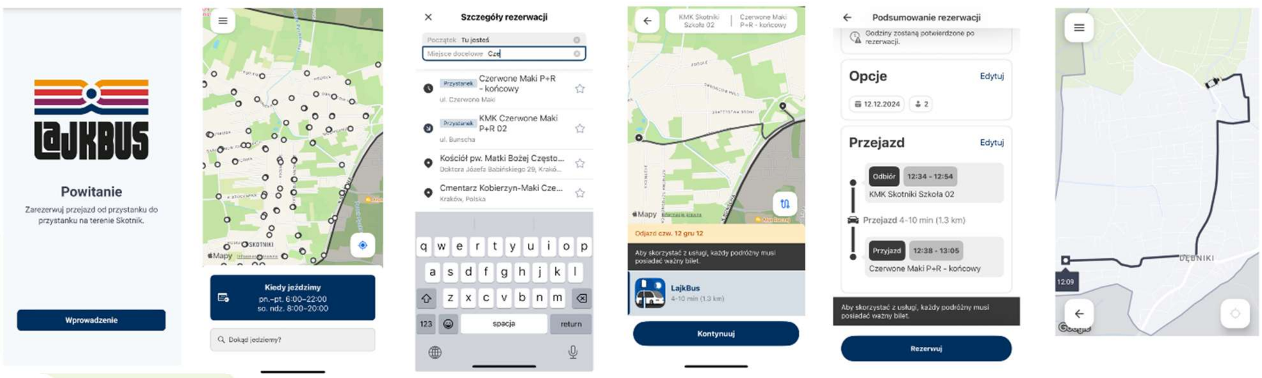


Figure 6 Screenshot LajkBus application (Krakow)

Demonstration timeline and phases

The LajkBus service was introduced as a pilot project, with implementation structured in several stages.

- **Preparation phase**: The service area selection was based on detailed analyses conducted in cooperation with experts from the Jagiellonian University. Initially, twelve areas of Krakow were evaluated, with Skotniki identified as the most suitable location for implementation (December 2023 – November 2024) . In parallel, extensive preparatory activities were carried out by the project team, including the identification and selection of suitable software solutions, internal system testing, fleet preparation, recruitment and training of drivers, as well as the development of operational regulations, privacy policies, and other legal and organizational documentation necessary for service implementation.
- **Closed testing phase:** Prior to the official launch, a closed testing phase of the application was conducted among residents who had expressed interest in participating. This stage enabled users to provide feedback, report issues, and suggest improvements, contributing to the refinement of the service (December 2024 – January 2025). In December 2024, consultation meetings with local residents were also organized in order to present the service concept, discuss operational principles, and collect feedback from potential users before the pilot launch.
- **Pilot launch**: The service was officially launched in February 2025 as a pilot in the Skotniki district. The initial deployment included a limited fleet and focused on testing operational feasibility and user acceptance.
- **Operational phase**: The service operates on weekdays (Monday to Friday) between 6:00 and 21:00, targeting peak commuting periods and daily mobility needs. During this phase, real-time adjustments are made to improve efficiency and service quality (throughout the whole period of the operation of the service).
- **Evaluation phase**: Continuous monitoring of usage patterns, passenger numbers, and operational performance supports the evaluation of the pilot. Early results indicate growing user interest and regular usage, particularly during peak hours (throughout the whole period of the operation of the service).

This phased approach allows for iterative improvements and provides a basis for potential expansion to other areas of the city.

Involved stakeholders and their roles

The LajkBus demonstration involves multiple stakeholders working collaboratively to design, implement, and evaluate the service.

- The City of Krakow and the Public Transport Authority in Krakow play a central role in the project. The City of Krakow is responsible for initiating the demonstration as part of its broader sustainable urban mobility and climate policy, aimed at reducing car dependency, improving accessibility in peripheral districts, and promoting innovative shared mobility solutions. The Public Transport Authority in Krakow oversees the operational and strategic management of the project. Its responsibilities include defining service objectives and operational zones, supervising integration with the existing public transport network, coordinating cooperation between technology and transport partners.
- ZF as technology provider -is responsible for developing and maintaining the mobile application, routing algorithms, and backend systems.
- Jagiellonian University contributed to the analytical phase, supporting the selection of the most suitable implementation area.
- Local residents and users play a key role by participating in the pilot and providing feedback, which is essential for improving the service.

3.3.2 Rotterdam

At the beginning of the SUM project, all active mobility providers operating in the Rotterdam area were invited to cooperate in the development of the prediction model. Since RET has no formal contractual or legal relationship with these providers, participation and data sharing were voluntary. Unfortunately, only CHECK was willing to share trip data and actively cooperate with the project when required.

At the start of the project, CHECK operated e-mopeds only and had not yet introduced e-bikes (e-bikes were launched by CHECK in 2026). Although other providers such as Lime and Donkey Republic operated shared bikes at the beginning of the SUM project, their data could not be used for the prediction model. In addition, Donkey Republic lost its operating licence in Rotterdam in mid-2025. Since the prediction model requires at least one year of historical data, only providers with a sufficient operational track record and available data could provide valuable input for model development. Therefore, the prediction model developed within SUM is based on historical e-moped data from CHECK.

The SUM project itself is not able to fully assess the relationship between the use of e-mopeds and e-bikes in terms of modal choice, as e-bike data became available only after CHECK introduced this service in 2026. However, based on the data currently available from CHECK, an initial pattern can be observed: users tend to use e-bikes more frequently in inner-city neighbourhoods, while e-mopeds are more commonly used in outer neighbourhoods and for trips across different areas of the city. The average distance travelled by e-bike users is also lower than for e-moped users. These observations provide valuable insights for future research but are not yet incorporated into the current prediction model

In cooperation with TU Delft and Siemens Mobility, RET has launched a predictability model into the RET travel planner app. This new functionality will improve multimodal journey planning, support seamless first/lastmile options and address demand and supply of micromobility. Each of the partners has built a part of the model, together we have created one fully functional tool that has been live in the RET app since July 2025.

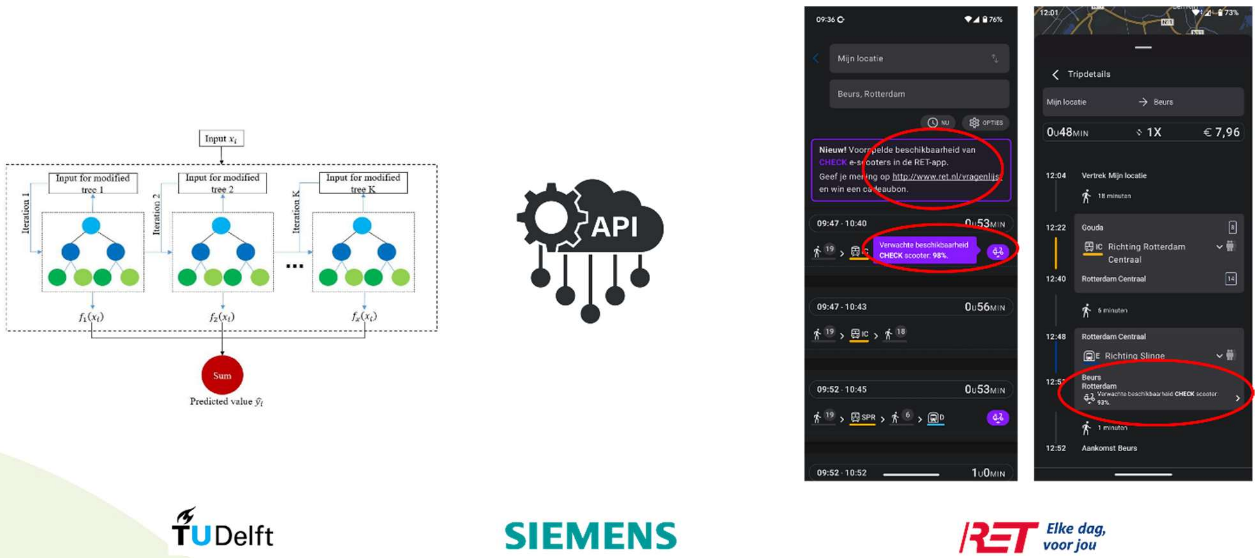


Figure 7: Technical components (Rotterdam)

TU Delft

TU Delft has gathered historical data on the use of the shared e-moped provider CHECK in the Rotterdam area. The data contains trip patterns based on opening and closing moments of the vehicle translated to longitude and latitude datapoints. This data was critical input for the forecasting model that has been build based on the scientific XGBoost protocols, a powerful machine learning algorithm. This is a widely used model for prediction and classification. The results of the algorithm are presented in expected availability of a shared e-moped in blocks of 25% (0% – 25%, 26% - 50%, 51% - 75%, 76% - 100%). The availability of the CHECK e-moped is presented up to 90 minutes before arrival at the planned destination where the model is active. See figure 8.

Siemens

To be able to present the results of the algorithm Siemens has built an API. This API made it possible to transfer the results of the algorithm to the back end of the RET application.

RET

Together with the RET app provider/developer Infoplaza, the API has been configured into a usable interface in the RET app. This involved converting the data into presentable and understandable visuals, positioned in such a way that it makes sense for users to use the model and it suits their travel patterns. See figure 8.

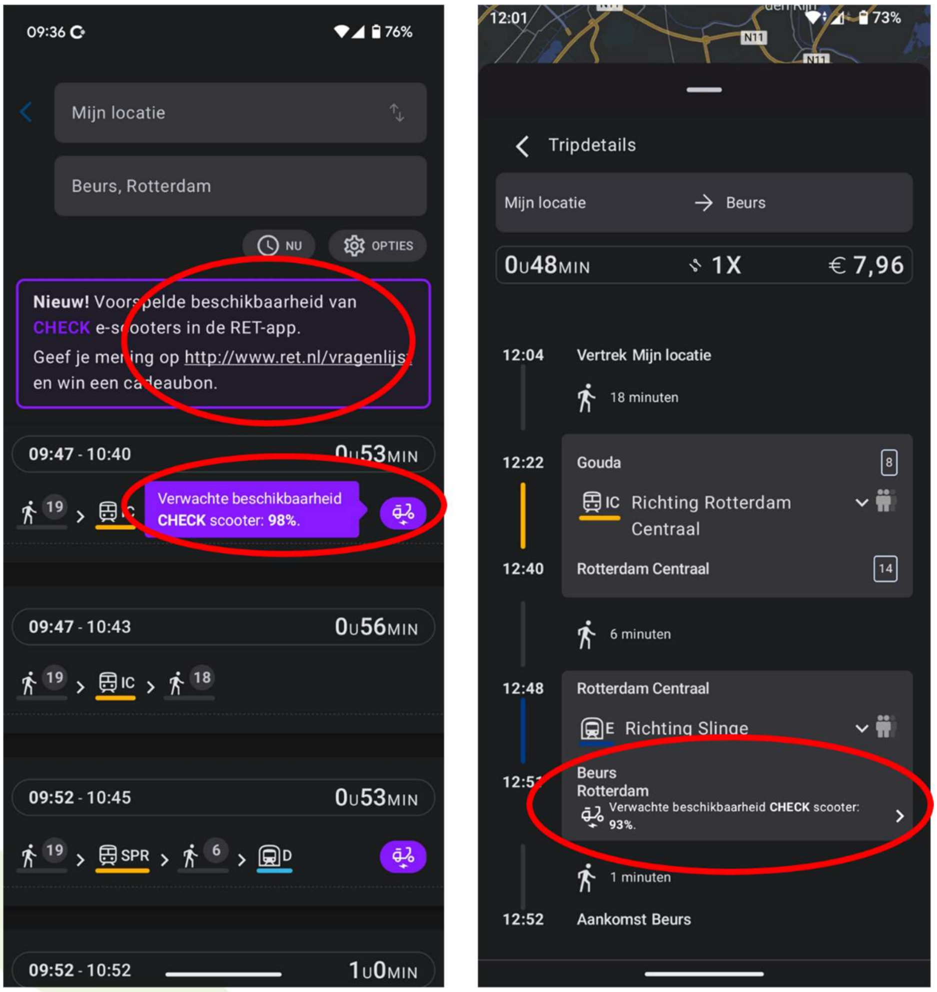


Figure 8: Screenshot RET application (Rotterdam)

3.3.3 Coimbra

The pilot developed by the Coimbra Living Lab consisted of the implementation a flexible passenger transport service operating in Cernache, a peripheral area of the municipality. The service provides a connection between this area and the Casconha interface, where passengers can transfer to the regular network to access the city center.

This service was designed with two operational modes:

- During peak hours, the service operates with fixed routes and schedules.
- Between peak hours, the service operates as an on-demand transport, serving predefined stops based on bookings.

The on-demand transport service follows fixed schedules defined to guarantee the connection to the regular network.

Users can book trips in advance throughan online platform or by contacting a call center. Bookings must be completed up to two business days before the trip: until 11:59 PM when made through the online platform, or until 5:00 PM when made via a free call to the customer service centre.

When bookings are completed, the algorithm optimizes the routes and sets the stop times. These are communicated to passengers by 3:00 PM on the business day before the trip.

Passengers without a reservation can also use the on-demand transport service at any stops along the defined routes, subject to vehicle capacity.

The service is operated using minibuses adapted to local road conditions and accessibility requirements. These vehicles ensure accessibility for elderly users through low-floor access, and for people with reduced mobility through ramps and dedicated wheelchair spaces.

Figure 9 Flexible Transport Service Promotional Flyer – Cernache (Coimbra)

The flexible passenger transport service is integrated with the regular public transport network, providing first- and last-mile connectivity and enhancing the overall attractiveness of public transport. Connections are through a predefined interchange point (Casconha), allowing passengers to access the routes to the city center. Schedules were defined to enable coordinated transfers.

Figure 10 Connection between the Flexible Passenger Transport Service and the regular Public Transport in Casconha (SMTUC) (Coimbra)

A dedicated platform was developed to support the service operation, ensuring flexibility, operational efficiency, and accessibility for different user groups. The platform enables reservation management, route optimization, and communication of stop times to passengers, and includes three main modules:

- Customer: the customer module was developed for those who are comfortable with new technologies, and it is available online, allowing users to book trips, to receive confirmations, and to look at all the user's information regarding the on-demand transport service.

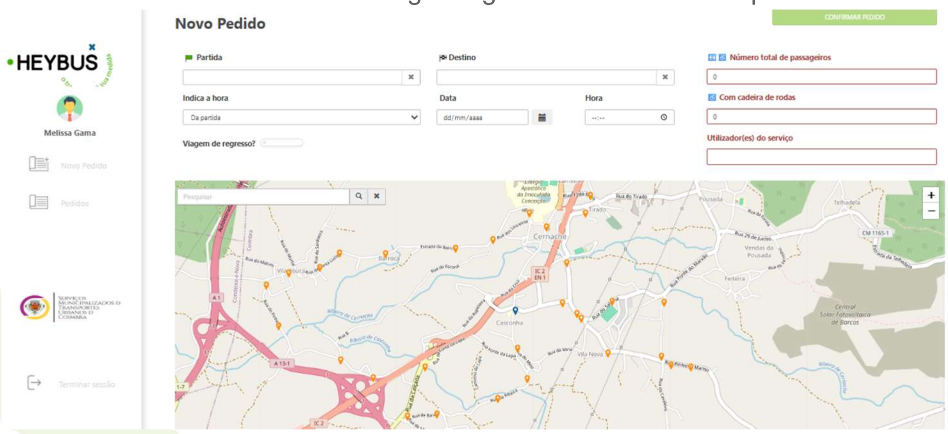


Figure 11 On-demand transport Booking Platform Interface (HEYBUS) (Coimbra)

- Call center: the call center module was developed for those who do not want to use the customer module and for the digital-excluded groups. Users reach the call center, and the internal services of the operator use the call center module to book trips and manage the confirmations issued.

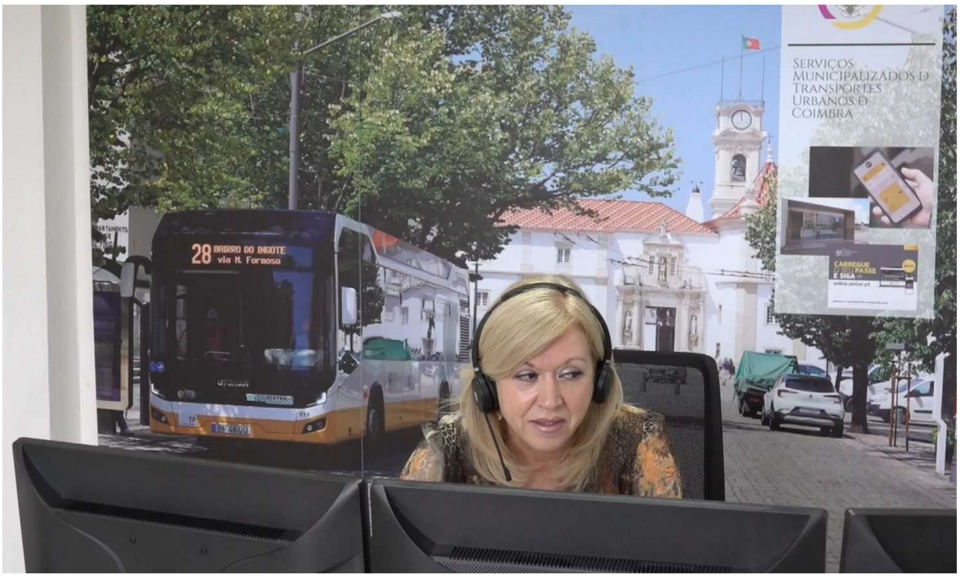


Figure 12 Call Center Support for on-demand transport Service (SMTUC) (Coimbra)

- Operator: the operator module is available only for the operator where the algorithm for route optimization and stop times setting can be run and where all the information about the on-demand transport service to be carried out is displayed.

The implementation of the pilot followed three main phases. The first phase included planning and preparation, the second phase included implementation of the pilot, and the third phase consisted of monitoring, evaluating and adjustment of the service.

Planning and Preparation (M6–M18)

- Selection of the implementation area.
- Characterization of the existing public transport system, including demand patterns, resource allocation (drivers and vehicles), and operational costs and revenues.
- Assessment of travel behavior, policy perceptions and residents' views on the mobility system through an online survey developed under WP1 (ex-ante).
- Design of service, balancing requirements and the user needs.
- Development of the digital platform, integrated with the SMTUC Operational Support System, including a call center to support elderly and digitally excluded users.
- Definition of the pilot launch during the European Mobility Week, including supporting communication activities.

Implementation (M15–M18)

- Development and distribution of promotional materials (flyers) delivered door-to-door and in strategic locations such as cafés and health facilities.
- Organization of two public presentation sessions in Vila Pouca de Cernache and Orelhudo on 14 September 2024.

- Official launch of the pilot on 16 September 2024, including a press conference held onboard a minibus in Casconha.
- Launch of the digital platform and call center.

Figure 13 Coimbra Living Lab Team – Launch of Flexible Passenger Transport Service

Monitoring and Evaluation (M18 onwards)

- Continuous monitoring of service performance and usage data.
- Implementation of a follow-up promotional campaign after the restoration of normal operations, as ongoing roadworks had temporarily affected connections to the city center and transfer reliability.
- Assessment of social acceptance through an online survey (WP1) and complementary in-person interviews.
- Post-implementation assessment of travel behavior, policy perceptions and residents' views through an online survey developed under WP5.

The flexible passenger transport service relies on coordinated action among multiple stakeholders, each contributing specific expertise and responsibilities:

- Municipality of Coimbra: coordination of the Living Lab activities and ensuring alignment with local mobility policies.
- SMTUC: responsible for service operation, reservation management, call center operation, and data collection.
- OPT - Optimização e Planeamento de Transportes: development, deployment and maintenance of the digital platform.
- Cernache Parish Council: local partner facilitating community engagement and user.

- Local population: end users of the service and contributors of feedback through surveys and engagement activities.

3.3.4 Fredrikstad

Description of the shared mobility measures assessed / implemented

The demonstration in Fredrikstad focused on testing shared and on-demand mobility services, with a particular emphasis on ferry-based mobility (Hyke F-15 Shuttle) as a complementary solution to the existing public transport system. The measures were designed to address identified challenges related to accessibility, first- and last-mile connectivity, and cross-river mobility, in line with the objectives defined for the Follower Living Lab. The demonstrated measures were implemented as pilot activities under real-world operating conditions, enabling the municipality and involved stakeholders to gain practical experience with the integration of ferry-based mobility services into the existing transport system.

Integration with public transport

A key element of the Fredrikstad demonstration was the integration of shared and on-demand mobility services with existing public transport offerings. This integration focused primarily on functional and operational coordination rather than full technical integration, reflecting the baseline situation and local context.
In practice, this coordination focused on aligning service interfaces such as information provision at quays and onboard, as well as basic coordination of service expectations between the municipality, the ferry operator and the mobility provider. The integration did not include full technical integration (e.g. ticketing or MaaS), but was primarily organised through operational collaboration and communication between the involved actors. The ferry service was also made visible within existing journey planning tools, allowing users to access information on routes and departure times.
The demonstrated services were intended to complement public transport by providing additional flexibility and connectivity, particularly in areas or time periods where traditional public transport services have limited coverage.

Technological components and digital tools

The demonstration utilised digital tools and platforms provided by the mobility service operators to enable booking, service management, and basic data collection. These technologies supported day-to-day operations of the demonstrated services and enabled the collection of relevant usage and operational data for evaluation purposes.
This included the operator's booking and service management interfaces used during the pilot, as well as operational logging and reporting from the ferry service. In addition, QR-based data collection was used to capture user feedback through the onboard survey. The ferry service was also made visible through existing journey planning tools (e.g. Entur) and through municipal information channels, enabling users to access information on routes and departure times.
The focus was on testing solutions that could be feasibly implemented within the existing local digital and organisational framework, rather than introducing large-scale or highly customised technological systems.

Demonstration timeline and phases

The demonstration in Fredrikstad was carried out in several phases, including planning and preparation, implementation of pilot services, and subsequent evaluation. This phased approach enabled iterative

learning and adjustment of the demonstrated measures based on operational experience and stakeholder feedback.
The implementation phase corresponds to the Hyke F-15 Shuttle pilot period (April 2024 – August 2025), with planning and preparation activities carried out prior to this period and evaluation activities conducted alongside and following the pilot.

Involved stakeholders and their roles

The demonstration involved a range of local and regional stakeholders, including the municipality, public transport authorities, shared mobility service providers, and other relevant partners. The municipality primarily acted as a coordinating and enabling actor, facilitating collaboration between stakeholders, and ensuring alignment with local strategies and policy objectives.
Close cooperation between public and private actors was essential for effective implementation and for generating lessons related to governance, coordination, and operational responsibilities.

3.3.5 Larnaca

The Larnaca Living Lab demonstration focused on the integration of NSM services with PT. The demonstration implemented a set of coordinated interventions combining digital solutions, service improvements, and policy measures to enhance intermodality, improve accessibility, and support sustainable urban mobility.

A central element of the demonstration was the use of a MaaS platform, enabling the integration of bus and bike services and supporting seamless, user-friendly mobility solutions. The measures implemented are structured below into pull and push interventions.

NSM and PT Integration (MaaS) - Pull Measure

This measure focused on the integration of shared mobility services with public transport through the PAME APP MaaS application. Bikesharing service from Nextbike was integrated into the application, allowing users to combine bus and bike journeys within a single system.

In line with the GA, the demonstration also included the planned introduction of additional shared mobility modes, such as e-scooters and e-bikes, to further enhance multimodal integration. The technical integration of these additional shared mobility modes was successfully completed within the MaaS platform as foreseen in the GA. However, the operational deployment of e-scooters in Larnaca could not proceed due to regulatory restrictions subsequently introduced by the Municipality of Larnaca, which effectively prohibited their use at the local level. Similarly, although e-bikes were considered within the scope of the demonstration, their deployment was not realised due to the absence of the necessary supporting infrastructure from the Municipality. These circumstances were outside the control of the consortium and affected the operational implementation of the services rather than their technical integration implemented by the project partners. Nevertheless, the developed MaaS solution remains capable of supporting e-scooter and e-bike services should the relevant regulatory and infrastructural conditions become available in the future.

The MaaS solution provides key functionalities such as journey planning, single ticketing, payment, real-time information on bikes, and bike unlocking, enabling a seamless multimodal travel experience. The objective of this measure was to increase convenience, improve user experience, and provide a reliable alternative to private car use.

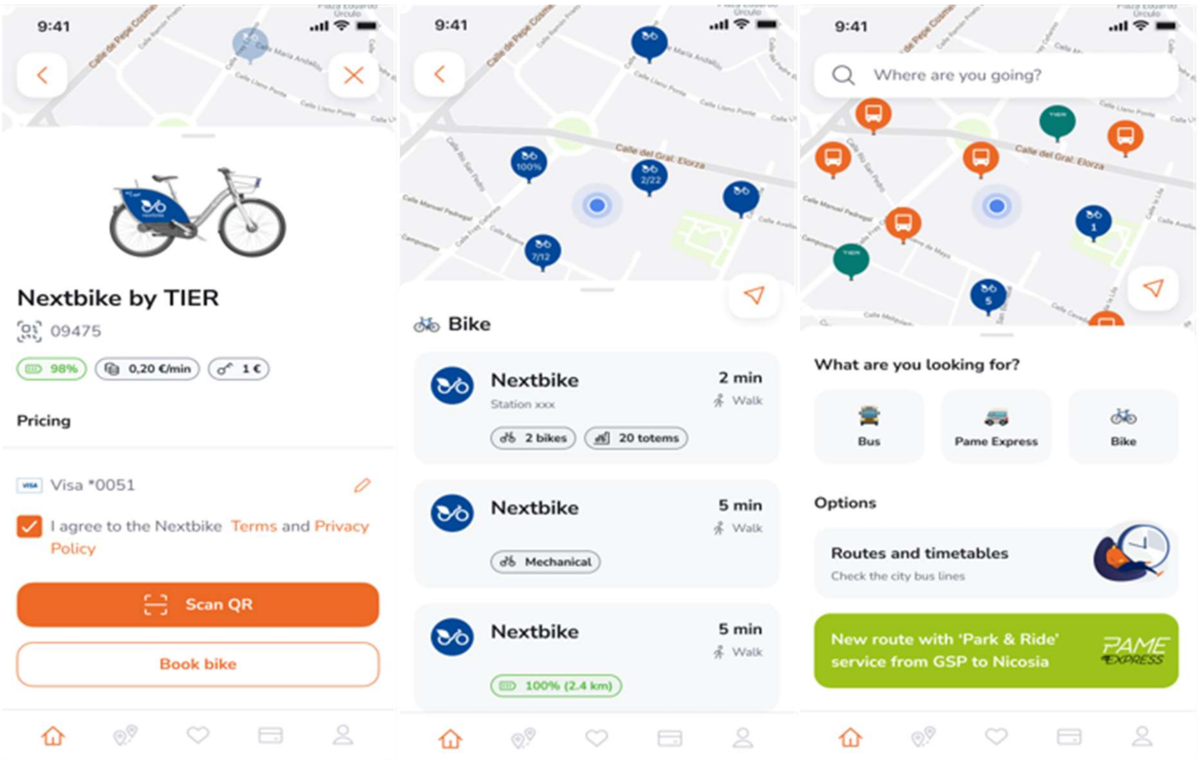


Figure 14 NSM and PT Integration Measure - PAME APP MaaS application

Ticketing (Price Setting & Nudging) - Pull Measure

This measure focused on the implementation of integrated ticketing and incentive-based mechanisms through the PAME APP MaaS application. The solution allows users to combine bus and bike services within a single ticket, supported by pricing strategies and incentive schemes.

The intervention included the introduction of new business models, specifically one B2B model between Larnaca Public Transport (LPT) and Nextbike and one B2C model between LPT and the public users, enabling the operational and commercial implementation of the combined mobility service. In addition, nudging mechanisms were applied through user engagement actions, such as the “Combine Bus & Bike with the PAME App” competition, which aimed to incentivise users to adopt multimodal travel behaviour by rewarding participation and usage of the integrated service.

The measure aims to improve accessibility and usability by providing a one-app solution for multimodal travel, while encouraging behavioural change through pricing and engagement incentives. The objective of this measure was to enhance user experience and attract users towards combined public transport and micromobility services.

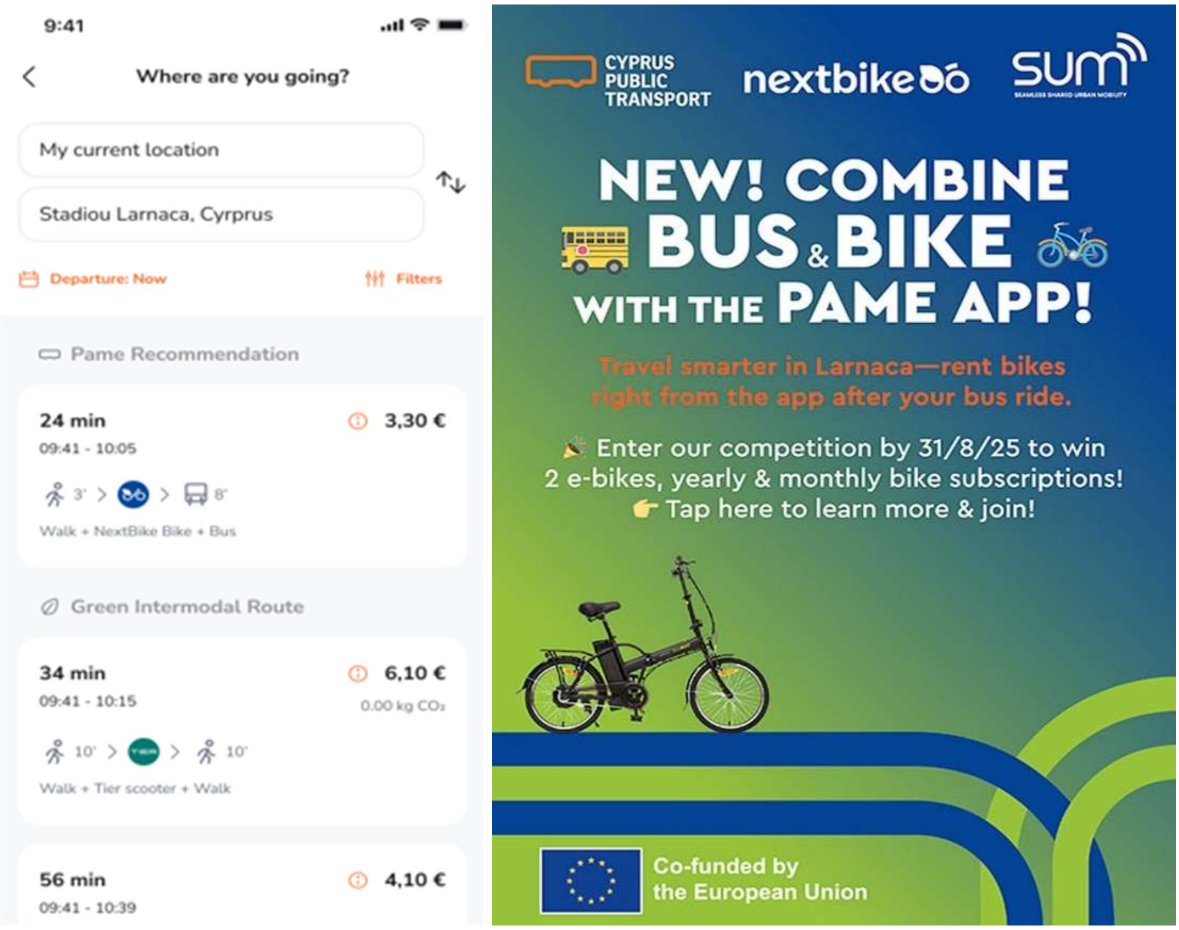


Figure 15 Ticketing Measure – Price Setting and Nudging.

Expansion of the Bike-Sharing Network - Pull Measure

This measure focused on the deployment and expansion of a structured bikesharing system in Larnaca. Before the SUM project, bikesharing services in the city were practically non-existent, with limited nextbikes available in private locations (e.g. hotels). Through the SUM project and with the approval of the Municipality of Larnaca, a structured bike-sharing system was introduced, providing a new shared mobility service in the city.

The intervention involved the provision of bicycles across multiple locations, enhancing predominantly last-mile connectivity and improving access to public transport, allowing users to combine bikesharing with bus services. By providing an additional mobility option, the measure supported the integration of new shared mobility services into the overall transport system.

The objective of this measure was to introduce bikesharing as a new mobility option, increase the availability of shared mobility services, and encourage a shift away from private car use by supporting multimodal travel behaviour.

Figure 16 Bikesharing (Nextbike) expansion to the city of Larnaca Measure

Increase in Public Transport Frequency — Pull Measure

This measure focused on the optimisation of public transport services through the increase of bus service frequency on key routes in Larnaca. The intervention was introduced to improve service availability and reliability, supporting the integration of public transport with shared mobility services.

The measure involved targeted adjustments on selected routes, where service frequency was enhanced compared to the baseline situation before the SUM implementation. These changes aimed to better respond to passenger demand and improve the overall performance of the public transport system.

By improving service frequency and reliability, the measure strengthened the role of public transport as a core component of the multimodal system and enabled better coordination with bikesharing and MaaS services. This contributed to making combined bus and bike journeys more practical and attractive for users.

The objective of this measure was to increase the attractiveness and usability of public transport, support multimodal travel solutions, and encourage behavioural change by providing a more reliable and accessible service offering.

Figure 17 LPT operation with increased bus service frequencies Measure

Utilisation of the Transport Network using HARMONY MS - Pull Measure

This measure focused on the use of a data-driven modelling tool (HARMONY MS) to support the evaluation, optimisation of the transport system and evaluation and impact assessment activities. Although this is not a user-facing mobility service, it is considered a supporting measure within the Living Lab, as defined in the project, contributing to the assessment and improvement of mobility interventions.

The tool was used to analyse mobility patterns, traffic conditions, and overall system performance, enabling the testing of different mobility and policy scenarios. A microsimulation model of the Larnaca transport network was developed, covering the wider urban area and allowing the assessment of key indicators such as traffic flows, travel times, delays, emissions, and network performance. Specifically, the microsimulation was used to test scenarios including the restriction of on-street parking in the Skala commercial district, the area's primary trip attractor, and the introduction of a P&R scheme at peripheral locations, evaluating their combined impact on traffic volumes, emissions, travel speeds, and modal shift towards public transport.

The objective of this measure was to support evidence-based decision-making and improve the effectiveness of mobility interventions through continuous monitoring, simulation, and data-driven analysis.

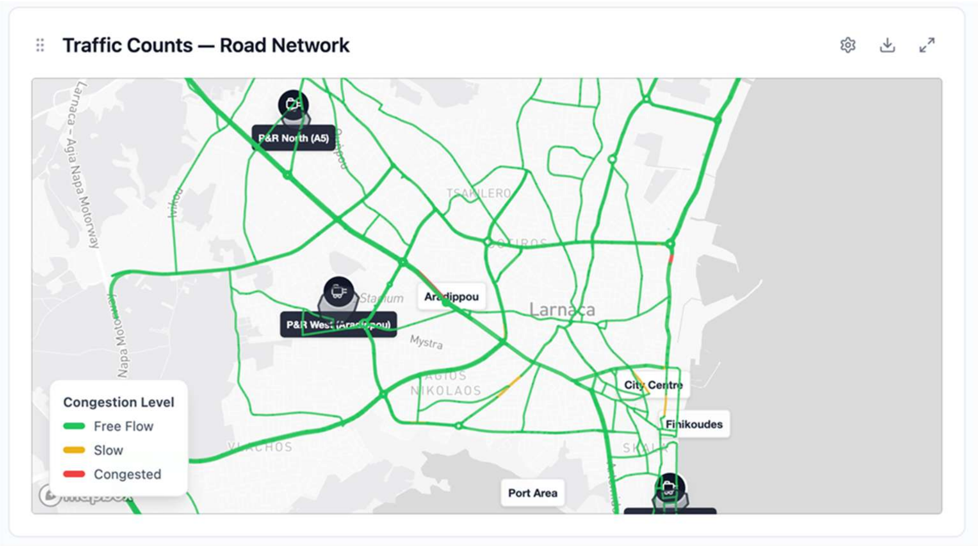


Figure 18 Simulation of Larnaca Transport Network using HARMONY MS Measure

Parking Restriction and Limited Access Zones - Push Measure

A push intervention related to parking restrictions and limited access zones was identified to support the transition towards more sustainable mobility patterns within the Living Lab area. Within the scope of the project, the focus was primarily on contributing to the development of policies that facilitate the adoption of sustainable mobility solutions. This effort was carried out through the Sustainable Urban Mobility Plan (SUMP) of Larnaca, where such measures are embedded as part of the broader strategic framework. These measures aim to reduce congestion and manage access to the city centre.

By limiting parking availability and improving control of access zones, the intervention supports a shift away from private car use. The objective of this measure is to reduce traffic congestion, encourage the use of public transport and shared mobility, improve safety, and reduce environmental impacts.

Two P&R facilities were identified within the SUMP of Larnaca to be developed as part of the city's long-term mobility strategy. These facilities are expected to support the urban transport network by enabling travellers to combine private car use with public transport, thereby reducing congestion in the city centre and improving overall network efficiency.

Figure 19 Two Park and Ride areas will be created in Larnaca (SUMP)

Furthermore, the implementation of dedicated bus lanes and bike lanes on strategic axes of the city as part of Larnaca's SUMP has already commenced in late 2025, with an overall implementation duration estimated at 16 months. The ongoing works include the construction of bus lanes and bicycle infrastructure, but also the installation of bicycle stations at key transfer points, enabling seamless integration with public transport and supporting first- and last-mile connectivity within the urban mobility system.

Figure 20 Ongoing implementation of Bus Lanes and Bike Lanes in Larnaca (SUMP)

A key aspect of the demonstration was the integration of shared mobility services with public transport through the MaaS approach. The PAME application enabled seamless interaction between bus and bikesharing systems, allowing users to plan multimodal journeys, access real-time information, and use combined ticketing within a single platform.

This integration aimed to improve connectivity between transport modes and encourage a shift away from private car use.

The demonstration relied on several digital tools and technological components. The MaaS platform served as the central interface for users, providing functionalities such as journey planning, ticketing, payment, real-time information, and bike unlocking.

In parallel, transport modelling and simulation tools (e.g. SUMO) were used to analyse traffic conditions, support network optimisation, and evaluate mobility impacts.

The implementation of the Larnaca Living Lab follows a phased approach, aligned with WP4 milestones, spanning from early 2024 through 2025 and continuing with ongoing evaluation and dissemination activities.

The first phase started in January 2024 (M8) with the initiation of the MaaS platform development, focusing on bus and bike integration. In parallel, data collection activities were initiated, including the gathering of traffic light timing data to support simulation in SUMO.

This was followed by a second phase in February 2024 (M9) and April 2024 (M11), where key system components were implemented. These included the initiation of ticketing integration with price setting and the initiation of the Nextbike network expansion. At the same time, stakeholder engagement was strengthened through activities such as an informational workshop on multimodal mobility for the city of Larnaca.

In June 2024 (M13), the Living Lab progressed to the next stage with the provision of bikesharing as a new shared mobility service in Larnaca and the increase in bus service frequency, marking the transition from planning to operational deployment.

The third phase, between July and August 2024 (M14–M15), focused on testing and validation, including the launch of MaaS platform testing in a pre-production environment and the completion of ticketing integration.

The fourth phase extended into early 2025 (M20–M22), marking the go-live of the MaaS platform in a production environment and its transition to full operation. During this period, user engagement actions were introduced, including the launch of the “Combine Bus & Bike with the PAME App” competition, while data upload to SUMO continued.

The fifth phase, covering May–June 2025 (M24–M25), focused on monitoring and data collection, including the design, execution, and analysis of the WP4 customer survey, as well as promotional activities including video campaigns.

In parallel, additional data collection and evaluation activities continued, including post-implementation surveys, interviews, and modelling updates, supporting the assessment of impacts and behavioural change.

The Living Lab is currently progressing through an ongoing evaluation and finalisation phase, focusing on consolidating results, integrating findings, and supporting long-term planning and replication.

The demonstration involved multiple stakeholders contributing to the design, implementation, and operation of the Living Lab. Key actors included the public transport operator, Larnaca Public Transport and its affiliated entity in the project, Cyprus Public Transport, both responsible for service operation, ticketing integration, and network optimisation, the shared mobility provider, Nextbike, responsible for the deployment and operation of the bike-sharing system and its integration into the transport network, the MaaS developer, Cunisa, responsible for the development and technical integration of the MaaS platform, and the data analysis and policy evaluation partner, MobyX, responsible for data collection, simulation, and the assessment of mobility impacts and user behaviour.

The local and national authorities, the Municipality of Larnaca and the Ministry of Transport, Communications and Works, played an important supportive and regulatory role by facilitating implementation, enabling approvals, and ensuring alignment with local mobility strategies and policies, however, they were not formal partners of the project. This multi-stakeholder structure reflects the collaborative approach between service providers, technology developers, and public authorities, demonstrating the essential need for coordinating shared mobility services with public transport and successfully deploying integrated, user-centric mobility solutions.

3.4 Data Collection Plan (Overview) & Follower LLs specific KPI’s - Focus on the results

3.4.1 Krakow

As part of the project, Krakow carried out surveys in accordance with the data collection plan. Various tools were used for this purpose to continuously monitor the roll-out of the ‘LajkBus’ on-demand transport service. Data collection plan:

- February 2025 – ZTP internal: Survey following the free pre-launch testing. Aimed at service testers. Information was gathered on issues with the app and service to enable adjustments to be made before the official launch.
- March 2025 – WP 1: Social acceptance of the LajkBus and user feedback on the LajkBus services, gathering information on issues and expectations. A survey aimed at users of the LajkBus service.
- October 2025 – ZTP internal: User feedback on the LajkBus services, gathering information on issues and expectations. A survey aimed at users of the LajkBus service.
- February 2026 – WP 1 & WP 5: Assessment of the transport system, public acceptance and use of shared mobility and travel behaviour. A survey aimed at users of the LajkBus service and residents of the Skotniki area.

For all our surveys, we used either Microsoft Forms or ArcGIS Survey123, depending on the level of detail required for the data being collected. The surveys were made available via the LajkBus app, which allowed them to be targeted directly at users, and in some cases we also used social media. In addition, data on all journeys completed and reported via the service is collected in the LajkBus system. This enables the verification of current demand for the service, journey routes and service quality (punctuality, journey time).

Our main objectives focused on ensuring that the service we rolled out would, amongst other things, be highly rated by users, that users would continue to want to use it, that there would be consistent access to the service (a high acceptance rate for requested journeys), and that waiting times for vehicles would be reduced. These issues are constantly monitored through regular surveys and data from the LajkBus system. In addition to the above KPIs, other indicators were also reviewed, such as:

- Acceptance level of implemented measures,
- Intention level to use LajkBus,
- Actual door-to-door travel time,
- Perceived door-to-door travel time,
- Perceived affordability,
- Modal split.

Detailed results for each KPI are presented in Chapter 5.

3.4.2 Rotterdam

Disclaimer: If you are looking for a detailed overview of the results, see annex 1, 2 and 3.

RET's data collection activities in the Rotterdam Living Lab are designed to support the design, calibration, piloting, and evaluation of integrated Public Transport and New Shared Mobility solutions within the SUM project. The collected data enables:

- Prediction of micro-mobility availability in relation to PT services
- Integration of these predictions into MaaS travel planning tools
- Assessment of user uptake, acceptance, and behavioural effects
- Impact analysis in terms of multimodality, accessibility, and reliability

Data collection by RET contributes primarily to WP1 (baseline and acceptance), WP2 (tool calibration and integration), WP4 (Living Lab demonstration), and WP5 (impact assessment).

From the overall research that has been done, the WP2 and WP5 assessments are perceived as complementary surveys:

- WP2 survey (July–August 2025) Focused on user experience and perceived value of the new fleet-availability prediction feature integrated into the RET app, targeting RET travelers and users of the new functionality.
- WP5 survey (September–October 2025) Focused on general acceptance of shared mobility, multimodal behaviour, and satisfaction with the Rotterdam transport system, using the RET panel as a representative (but older) user group.

Together, the surveys provide insight into technical acceptance, user perception, and behavioural barriers related to shared mobility and its integration with public transport.

3.4.3 Coimbra

Data collection within the Coimbra Living Lab combined quantitative and qualitative approaches, enabling a comprehensive understanding of both operational performance and user perception. Data was gathered throughout the planning, implementation and monitoring phases of the pilot.

Table 2 Ex-ante survey (Coimbra)

Purpose	To describe prior travel behavior, evaluate the transport system, and assess the existing transport policies
Methodology	Distribution: online (Microsoft Forms) Target audience: residents of the Assafarge, Antanhol, and Cernache Parish areas Collection Instruments: structured questionnaire developed under WP1
Survey	34 questions divided into four sections: 1. Transport system evaluation 2. Social acceptance and shared mobility usage 3. Present travel behavior 4. Socio-demographic characteristics Estimated duration: 10-12 minutes

The survey was adapted to the Portuguese context and disseminated through social media, local media and door-to-door flyer distribution. It was made available in November 2024, with a total of 210 complete responses.

Main findings:

- Private cars were the dominant mode for daily travel, particularly for commuting related to work and education, while shared mobility solutions played only a marginal role in mobility patterns.
- Satisfaction with the existing transport system was moderate, indicating neither strong dissatisfaction nor strong endorsement of current mobility services.
- Safety and security perceptions influenced travel choices, particularly regarding perceived accident risks and personal security concerns, which may act as barriers to shifts towards more sustainable modes.
- Acceptance of transport policies was moderate, suggesting openness to mobility improvements, but without strong public support or clear demand for transformative measures.
- The baseline results pointed to structural dependence on conventional travel modes, limited exposure to shared mobility concepts, and a context where significant behavioral change would likely require both service innovation and strong user engagement.

Table 3 Social acceptance survey and customer survey (Coimbra)

Purpose	To assess the social acceptance and user perception of mobility services in the area where the flexible passenger transport service was implemented
Methodology	Distribution: online (Microsoft Forms) and in person
	Target audience: user and non-users of public transport in the implementation area
	Collection Instruments: structured questionnaire developed under WP1 complemented by interviews to explore perceptions and barriers in greater depth
Survey	13 questions divided into three sections: 1. Transport system perception evaluation 2. Flexible passenger transport service perception evaluation

	3. Socio-demographic characteristics
	Estimated duration: 5 minutes

Due to difficulties in obtaining responses, the Municipality of Coimbra addressed the requirements of WP1 (social acceptance assessment) and WP4 (customer survey) by combining both tasks into a single survey, conducted online and in person, and complemented by interviews.

The survey was adapted to the Portuguese context and disseminated through social media and door-to-door flyer distribution. Its public release was postponed until the service reached a stable operational phase. It should be noted that ongoing roadworks affected connections to the city center, reducing transfer reliability and potentially influencing user perception.

The survey was made available in March 2025, resulting in 37 responses (12 online and 25 collected in person).

An important finding was the low level of awareness of the service, despite the promotional campaign carried out prior to the survey, which included flyer distribution with key information (timetables and booking procedures). This suggests that communication channels were not sufficiently effective in reaching the target population.

Another noteworthy observation concerns the contrasting perceptions between age groups: younger participants perceived the service as mainly useful for older adults, while older participants considered it more relevant for younger users. This mutual attribution indicates a lack of clear understanding of the service's flexibility and intended user base, potentially hindering its adoption.

Table 4 Post-implementation survey (Coimbra)

Purpose	To assess post-implementation travel behavior, evaluate the transport system, and analyze the implemented mobility measures
Methodology	Distribution: online (Microsoft Forms) and in person
	Target audience: the population of Cernache Parish area
	Collection Instruments: structured questionnaire developed by WP5
Survey	33 questions divided into four sections: 1. Socio-demographic characteristics 2. Transport system evaluation 3. Flexible passenger transport service evaluation 4. Present travel behavior
	Estimated duration: 10-12 minutes

The launch of the survey was postponed due to extreme weather events affecting central Portugal in early 2026. At the end of January, a severe depression caused widespread damage, leading to the declaration of a state of calamity until mid-February. The impacts included flooding, power outages, damage to housing, and disruptions to road infrastructure.

The online survey was made available to the public only in March 2026 and there was a total of 103 surveys completed.

Main findings:

- Awareness of the flexible passenger transport service increased, suggesting that implementation and communication efforts contributed to improving visibility of the new mobility solution.
- Actual use of the service remained very limited, confirming that increased awareness did not translate into significant uptake or behavioral change.
- Respondents generally perceived the service as easy to understand and use, indicating that complexity of operation or booking was not a major barrier to adoption.
- Despite this positive perception, respondents remained uncertain about the practical benefits and convenience of the service, suggesting that perceived usefulness remains a critical barrier to wider uptake.
- Acceptance of recently implemented mobility measures remained moderate, broadly consistent with ex-ante findings and indicating stability rather than significant change in public attitudes.
- Travel patterns remained largely unchanged, with private car and bus continuing as the predominant modes and travel still strongly structured around work and education purposes.
- Overall, results suggest modest progress in awareness and acceptance, but limited impact on actual travel behavior, reinforcing that longer implementation periods, stronger communication and improved service reliability may be needed to generate more substantial behavioral change.

Continuous monitoring

To support planning, operation, evaluation and continuous improvement, several data collection mechanisms were implemented.

The data sources included:

- Operational data provided by SMTUC, covering demand and supply indicators such as:
  - Number of users and trips performed.
  - Booking rates and share of booked versus non-booked trips.
  - Service punctuality and reliability.
- Feedback received by SMTUC or Coimbra Municipality (comments, complaints, and suggestions).
- On-site monitoring of service operations.

During the first month of operation, on-site monitoring identified a lack of coordination between the flexible service and the regular service connecting to the city center. This issue was mainly due to roadworks affecting the regular service.

Operational data also indicated low demand for the service. This was compounded by ongoing challenges faced by SMTUC, including driver shortages and vehicle malfunctions, which became critical at certain times and led to the temporary suspension of the service.

Co-creation and co-design

The Coimbra Living Lab also conducted a co-creation workshop focused on the future multimodal mobility hub at Praça Mota Pinto.

This participatory process brought together more than 50 stakeholders, including municipal planners, transport operators, institutional representatives and diverse user groups (e.g. students, hospital staff, older adults and a wheelchair user), ensuring a wide range of perspectives on accessibility, comfort, safety and usability.

Qualitative data were collected through group discussions, site visits and collaborative design exercises supported by maps and tailored materials. This approach enabled the identification of context-specific mobility patterns, user needs and perceived barriers.

Key findings highlighted recurring challenges related to pedestrian accessibility, waiting conditions and the integration of different transport modes. The diversity of participants proved particularly valuable, fostering mutual understanding and leading to more inclusive and user-centred proposals. Several of these proposals were considered feasible and directly informed the refinement of design solutions for sidewalks and the mobility hub.

Overall, the co-creation process generated actionable insights that supported the implementation and improvement of measures aimed at enhancing accessibility, comfort, perceived safety and the overall user experience. While the detailed methodology is addressed in WP3, this activity demonstrated the added value of participatory approaches in shaping more effective and widely accepted mobility solutions.

3.4.4 Fredrikstad

Data collection methods and plans

Data collection in the Fredrikstad Follower Living Lab combined (i) repeated, municipality-funded travel behaviour surveys and (ii) a Living Lab–specific in-situ user survey, supplemented by operational information from service delivery.

Municipal travel behaviour survey framework (context and baseline indicators):

Fredrikstad relies on an established municipal survey infrastructure conducted by NORCE and SINTEF. The repeated cycling travel survey waves cover the period from autumn 2021 to spring 2025 and include FRVU21 (autumn 2021 + spring 2022, n=1411), FRVU22 (autumn 2022 + spring 2023, n=1400), and FRVU24 (autumn 2024 + spring 2025, n=1400), corresponding to 4,211 completed interviews across the three waves. The surveys are implemented as telephone interviews (CATI) and provide methodologically consistent, repeated measurements that can be used as contextual and baseline indicators relevant to SUM (e.g., travel behaviour patterns and mobility attitudes).

Living Lab–specific user survey (demonstration-related insights):

To capture demonstration-relevant user experience and intermodality aspects, an in-situ onboard intercept survey was conducted among ferry passengers in Fredrikstad (QR code access on board). The survey collected 141 responses and covered satisfaction with the ferry and local public transport, perceived ease of intermodal transfers, frequency of ferry use, suitability for commuting, and a bike-sharing module to explore conditions for potential uptake (e-bikes, flexible return, pricing, and availability). The dataset reflects voluntary responses from ferry users present during the fieldwork period.

Living Lab–specific indicators and KPIs (focused set)

Given the local context and available data, Fredrikstad applied a focused set of Living Lab indicators combining:
(a) survey-based indicators (user satisfaction, transfer experience, stated needs, and acceptance-related signals), and
(b) contextual mobility indicators derived from the municipal survey framework (e.g., repeated travel behaviour and mobility attitudes over time).
These indicators were selected to support practical learning and to document implementation-relevant insights in a manner consistent with the Follower Living Lab reporting template.

Contribution of data to implementation and improvement

The combination of (i) repeated municipal survey waves and (ii) an in-situ ferry passenger survey enabled Fredrikstad to ground the demonstration in an established baseline/context, while also capturing user-centric insights linked to the demonstrated mobility measures (especially intermodality, service usability and improvement needs). This approach supported iterative improvement and provided evidence for the subsequent sections on results, lessons learned and transferability.

3.4.5 Larnaca

Data Collection Methods

The Larnaca Living Lab employed a multi-source data collection strategy across two distinct periods to capture both baseline conditions and the impact of implemented measures as outlined in Table 1.

Table 5 Data Collection Methods

Data Source	Description	Period	Sample / Scope
Resident Survey R1	Survey with geographic OD data, demographics, mode choice, safety perceptions	2024	n = 202
Resident Survey R2	Survey with activity-based OD, updated modal split, bikesharing attitudes, e-bus interest	2026	n = 232
LPT Passenger Data	Automated ridership counts by hour and trip, 2020–2026	2020–2026	6 years continuous
Bikesharing Rides	Trip-level data from nextbike/BICY system	2024–2026	Monthly aggregates
Traffic Simulation	SUMO-based microsimulation of parking restriction scenarios in the Skala district	2025 and 2026	Scenario modelling

How Data-Informed Measure Implementation

Each data source directly informed the design and calibration of Larnaca's five implemented mobility measures:

MaaS Platform: R1 survey data on mode choice (89% car dominance) and intermodal friction (low scores on ease of switching) justified the need for an integrated mobility-as-a-service platform. R2 data confirmed early adoption signals, with PT share rising to 37%.

Integrated Ticketing: Travel time data from both rounds (off-peak car vs PT comparison) and budget allocation patterns (38% spending 20–30% of income on transport) provided the cost-sensitivity evidence for fare integration.

Bike Network Expansion: R2 bikesharing data (41% adoption, up from 17% shared mobility in R1) and safety perceptions (bicycle crime risk dropping from 2.89 to 3.8/6) drove network routing decisions. Bikesharing ride volumes validated station placement.

Frequency Increase: LPT passenger data showing 50% year-on-year growth (5,886 to 8,838 riders) justified frequency enhancements. Time-of-day distributions from R1/R2 identified peak demand windows.

Parking Restriction (Skala): SUMO simulation results (15% traffic reduction, 12.4% CO_2 drop) provided the evidence base for restricting parking in the Skala commercial district. Synthetic OD allocation confirmed Skala as the dominant trip attractor (32% of all destinations).

Living Lab-Specific KPIs

The following table presents the KPIs defined for each implemented measure, their measured values, and the data source used for each calculation:

Table 6 Larnaca Living Lab-Specific KPIs

Measure	KPI	Result	Data Source
MaaS Platform	Multimodal trip share	**37% PT**	R2 Survey
	Mode switch willingness	**3.3/6**	R2 Survey
	App awareness	**Baseline set**	R2 Survey
Integrated Ticketing	PT mode share change	**+31 pp**	R1/R2 Comparison
	Budget efficiency	**10-20% modal**	R2 Survey
	Fare satisfaction	**3.1/6**	R2 Survey
Bike Network	Bikesharing adoption	**41%**	R2 Survey
	Bicycle mode share	**8%**	R2 Survey
	User satisfaction	**4.9/6**	R2 Survey
	Safety perception	**3.8/6**	R2 Survey
Frequency Increase	Annual ridership	**8,838**	LPT Data 2025
	Year-on-year growth	**+50.1%**	LPT Data 2024-25
	Jan-Feb 2026 trend	**+25% vs 2025**	LPT Data 2026

Parking Restriction	Traffic reduction	**15%**	SUMO Simulation
	CO_2 reduction	**12.4%**	SUMO Simulation
	Skala dest. share	**32%**	Synthetic OD
	Policy acceptance	**73%**	R2 Survey

3.5 Gathered Data & Results

The following subsections present the collected data and results individually for each Follower LL. Additionally, the annex 4.1.6 to this document includes supplementary materials and detailed outputs referenced and described throughout the main text, as well as the Investigation of Modal Shifts based on the ex-ante and ex-post surveys carried out in the LLs.

3.5.1 Krakow

The launch of the LajkBus service has been met with an extremely positive response from users. For many residents of the Skotniki area, where the service was launched, it was a game-changer, as the nearest public transport stops had previously been as far as 800–1,000 metres away, which was a significant inconvenience. However, improved accessibility is not the only visible benefit. The second factor is the greater willingness among residents, as revealed by survey data, to use public transport rather than their own cars. Whilst these results vary depending on the sample size of each survey, this shift is clearly evident.
As noted earlier, the most important indicator is the increase in access to public transport. Before the service was introduced, around 73% of residents lived within 400 metres of the nearest stop, whereas after its introduction, this figure was close to 100%. The blue colour in the graph below shows access to public transport stops (which existed prior to the service's implementation). The pink colour shows the area covered by access following the service's implementation. The accessibility analysis was carried out on the basis of actual access routes (roads and pavements) every 100 meters, rather than in a straight line from the specified points.

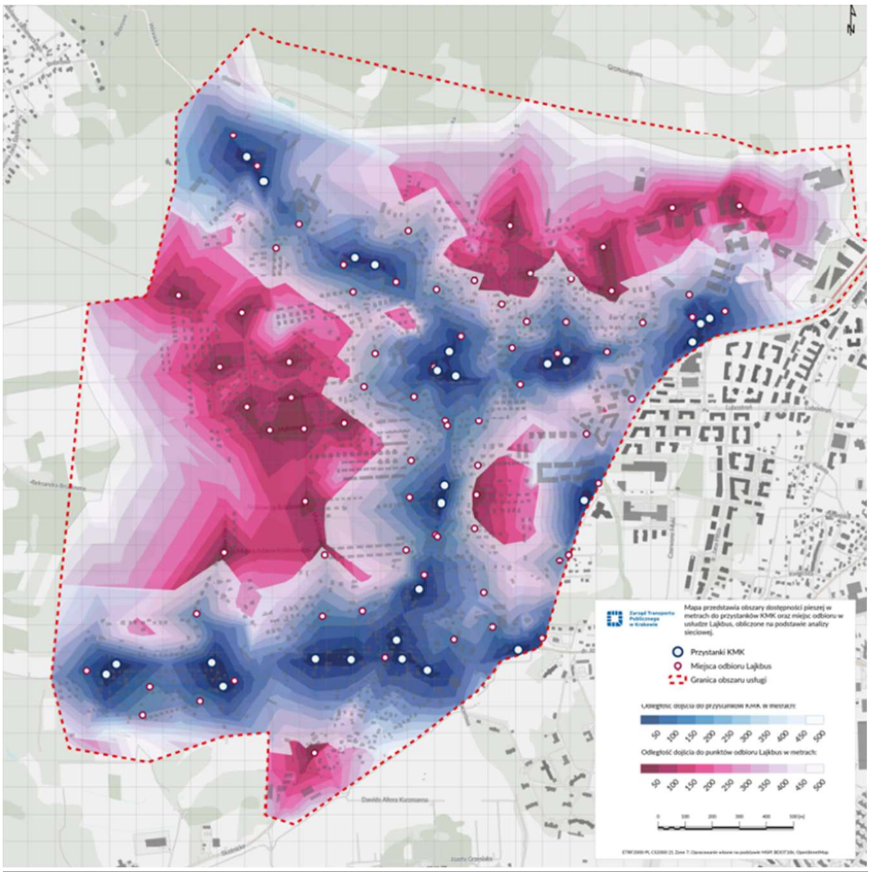


Figure 21 Accessibility to public transport stops (every 100m) (Krakow)

The table below shows detailed results for distances in 100-metre increments. Interestingly, access to the nearest stop within 100 meters has increased from around 10% to around 45%, which is also extremely significant, as more than four times as many residents now have a stop within ‘a few steps’ of their home.

Table 7 Percentage of residents within walking distance of a stop (Krakow)

Distance	Before	After
100 m	9,6%	45,1%
200 m	30,4%	85,1%
300 m	50,4%	98,3%
400 m	73,3%	99,9%
500 m	85,9%	100,0%

The figure 22 shows the weekly development of the LajkBus service in terms of the number of bookings, number of passengers, and pooling rate during the pilot operation period. In the initial phase of the deployment, both the number of bookings and passengers increased steadily as user awareness and acceptance of the service grew. After this initial growth period, demand stabilized at a relatively high level, indicating the gradual establishment of regular travel patterns among users.

A visible decline in demand can be observed during the summer holiday period, which is consistent with seasonal reductions in daily mobility demand related to vacations and reduced commuting activity. After the holiday season, the number of passengers and bookings increased again, reaching even higher values than before the summer period. This improvement can be associated not only with renewed travel demand but also with the continuous optimization of the service, including improvements in operational management and passenger pooling algorithms.

During the most successful operational weeks, the service transported approximately 1,200 passengers per week, while the pooling rate stabilized at around 70–80%, which can be considered a very high level of operational efficiency for a demand-responsive transport system. The temporary decline visible in December is mainly related to the Christmas and New Year holiday period, when overall urban mobility demand decreases significantly.

The results also suggest that the operational performance of the system was partially constrained by fleet size. A larger number of available vehicles would likely have enabled the system to accommodate more requests, improve service availability, and potentially achieve even better transport and pooling performance indicators.

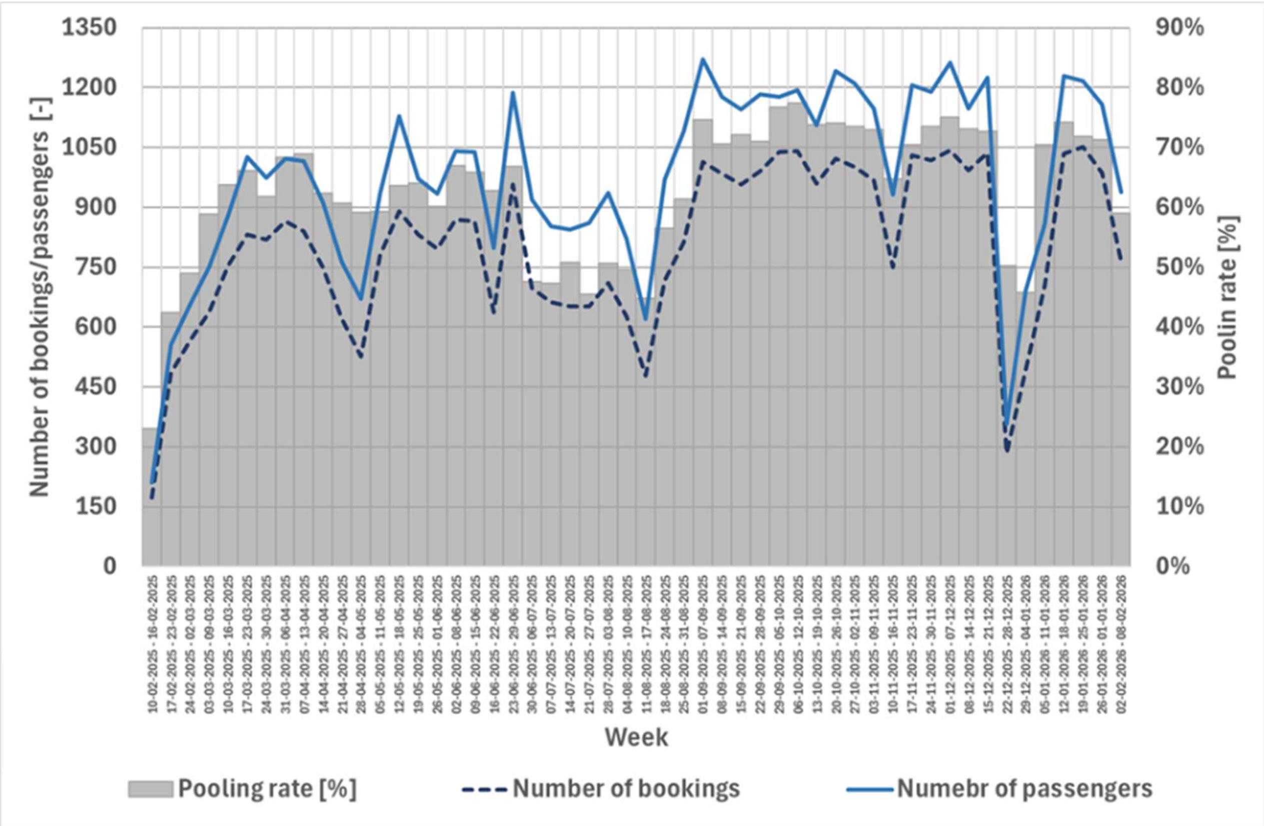


Figure 22 Results of the LajkBus system (Krakow)

The average waiting time for a vehicle was 6 minutes and 24 seconds, while the average journey time was approximately 7 minutes and 17 seconds. In the case of the KPIs defined by the SUM project, all results of the calculated KPIs are available on the SUM Open Data Platform website.

In the surveys, users were asked what modes of transport they used before the service was launched for the same journeys they now make using the LajkBus service. The results vary depending on when the surveys were conducted, but several key points are clearly evident. Firstly, there is a distinct and relatively large group of users who have stopped using their cars (between 26% and 45%). A large group of users has also stopped using public transport; however, it should be noted that LajkBus and public transport are integrated, which is why many people still use these modes of transport interchangeably depending on their needs. Around 27–28% of users stopped walking, which, however, led to shorter journey times. Other modes of transport account for only a small proportion of the total.

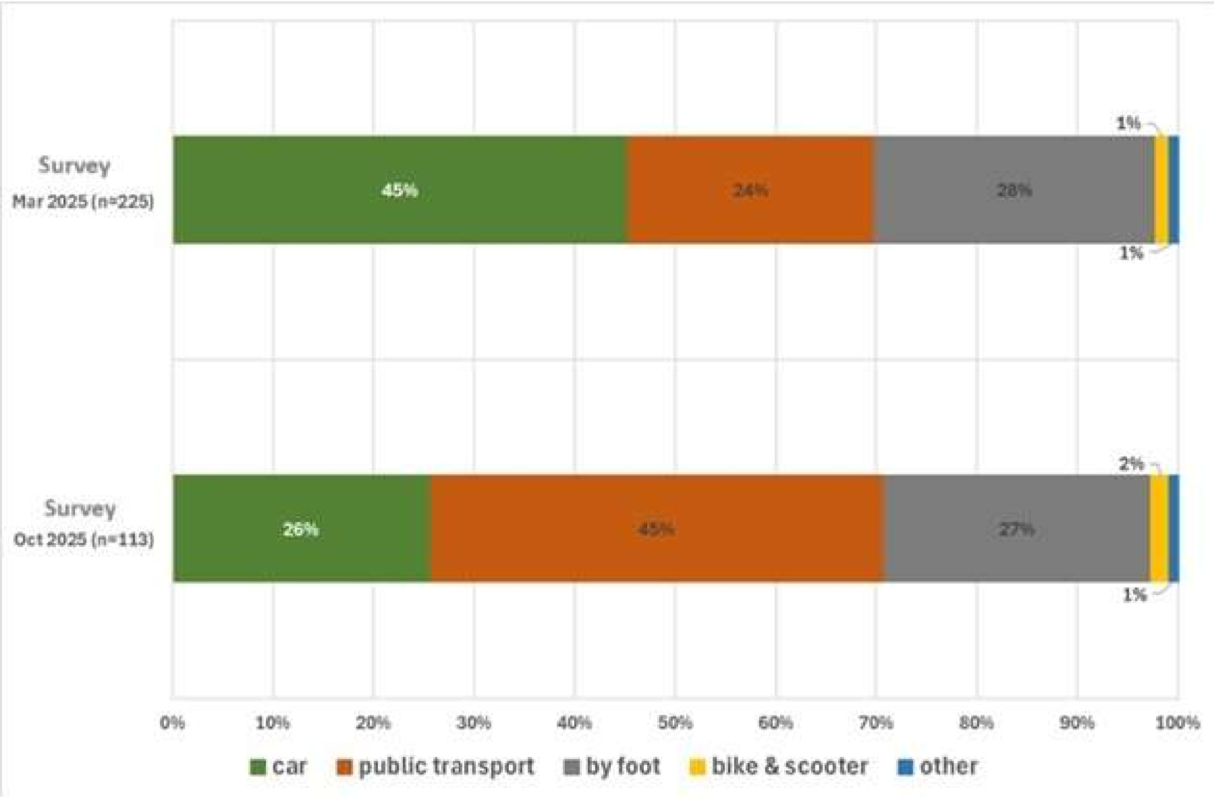


Figure 23 Modal split based on surveys, relating to journeys made in the past and which are now being made using LajkBus (Krakow)

Around 6% of users purchased a monthly public transport pass following the launch of the service. This figure relates to people who had not previously purchased such a pass. Whilst this figure is low, it is by no means negligible and clearly demonstrates that LajkBus has influenced the transport behaviour of local residents.

The launch of the on-demand transport service has changed users' perception of this form of transport. Before the service was launched, it was neither popular nor practical in Krakow, which is why many users were reluctant to use it in the future. Following its launch and after becoming familiar with the service, virtually all users rate the possibility of continuing to use it highly. The results are shown in the chart below.

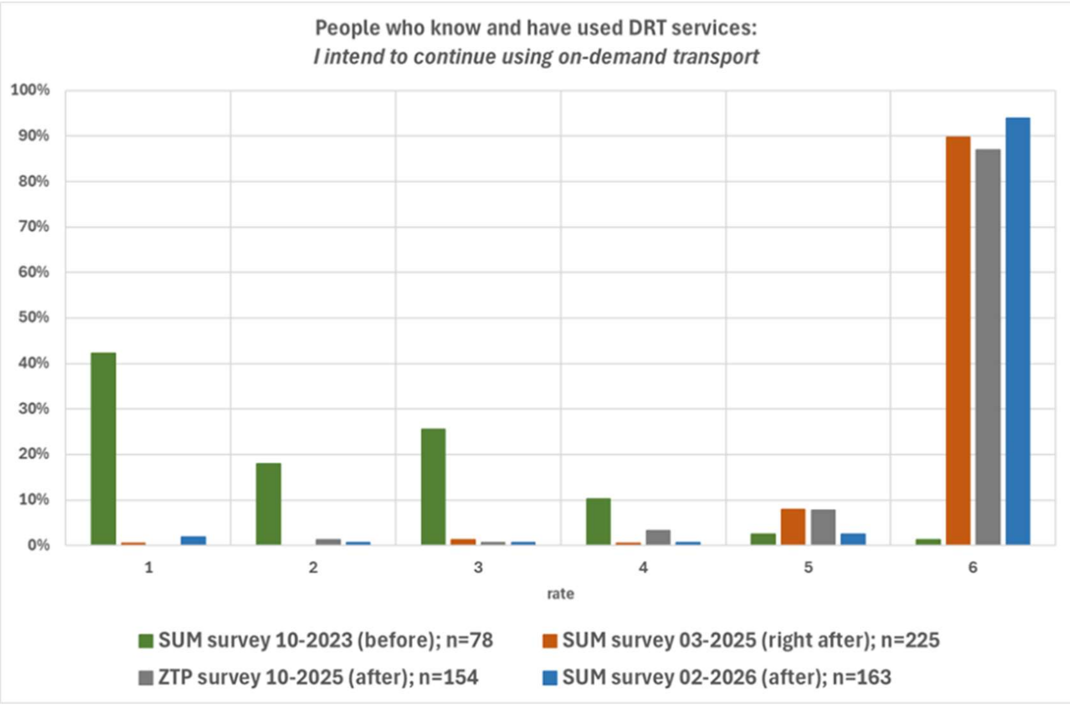


Figure 24 Intention to continue using on-demand transport (Krakow)

3.5.2 Rotterdam

Disclaimer: If you are looking for a detailed overview of the results, see annex 1, 2 and 3.

Throughout the project surveys have been distributed amongst specific target groups. In the table below an overview of all the research topics and related work packages can be found.

Table 8 Overview of Research Topics and Related Work Packages

WP	Data	Purpose	Timing and sample size
WP1	Pre-Implementation Survey (Participants: Rotterdam citizens)	Initial evaluation of use of public transit and shared mobility services based on at-the-time services in 2024.	
WP4	Customer Survey (Participants: RET app and tool users)	Initial evaluation of the usefulness of the tool; collection of feedback for continual improvement of the tool.	Jul – August 2025 – 91 respondents
WP1	Acceptance Assessment (Participants: RET panel)	Research based recommendations for further improvement of the relation between PT and Shared Mobility.	Sep 2025 – 269 respondents
WP1/WP5	Post-Implementation Survey (Participants: Rotterdam citizens)	Post-implementation evaluation of use of public transit and shared mobility services based on at-the-time services in 2025/26, and a checking point to review any improvements and attitude changes during the project time.	Feb 2026 – 200 respondents

The combined datasets show a clear and consistent picture:

- Rotterdam has a strong, trusted public transport system.
- Shared e-mopeds remain a marginal mode, especially for older and mobility-dependent users.
- Digital innovations such as availability prediction add genuine value, but for:
    - users already open to multimodal travel,
    - situations where reliability and safety matter most.
- Digital tools alone do not trigger mass adoption.
- Structural issues (convenience, time efficiency, safety perception, infrastructure, and regulation) dominate acceptance outcomes.

Overall conclusion

The Rotterdam research shows that predictive shared-mobility information adds real value for users who already engage in multimodal travel, improving confidence, perceived safety, and provider preference. At the same time, shared mobility remains far from mainstream, particularly among older and vulnerable user groups. Meaningful modal shift will require not only smart digital solutions, but also social, operational, and policy measures that align shared mobility more closely with the strengths and responsibilities of public transport.

Digital tools alone are insufficient to drive mass adoption of shared mobility. Wider uptake requires:

- Better coordination between shared mobility providers and public transport.
- Improvements in shared mobility operations themselves (parking, safety, reliability).
- Respect for vulnerable PT-dependent users who cannot or should not be pushed toward shared modes.

3.5.3 Coimbra

Three surveys were conducted during the project lifetime, allowing a comparison of mobility perceptions and behaviours before and after the implementation of the flexible passenger transport service pilot.

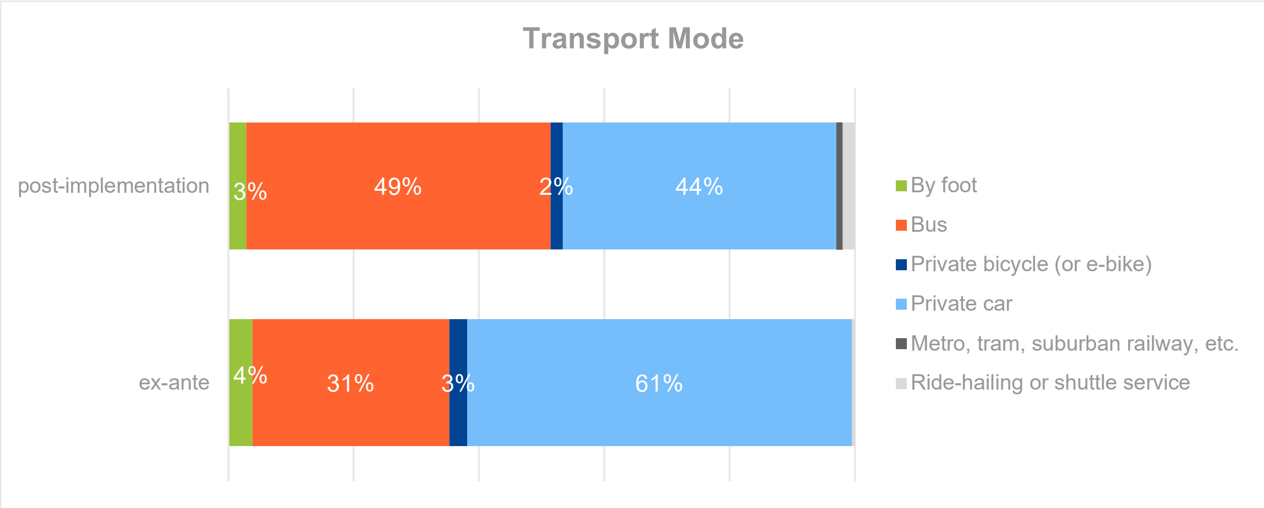
Overall, the data show modest but positive shifts in awareness, perceived usefulness, and acceptance of demand-responsive transport solutions, although actual usage levels remain low. This suggests that the implemented measures contributed mainly to attitudinal change, while behavioural change appears limited at this stage.

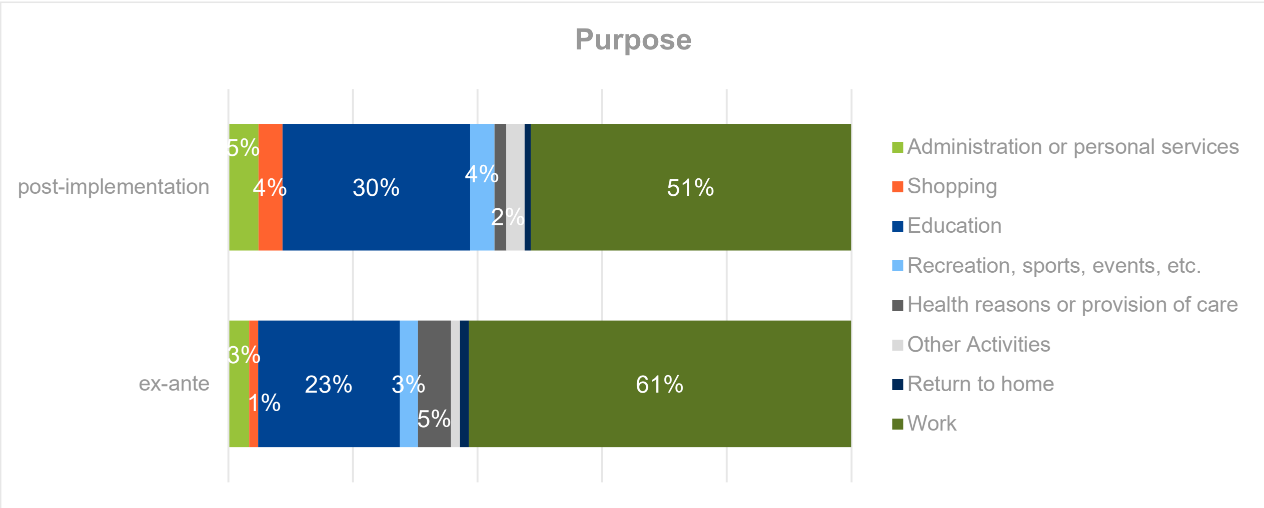
Travel behaviour and modal split

A comparison between the ex-ante and post-implementation surveys indicates that:

- Private car and bus remain the dominant modes for daily trips, with bus use showing a slight increase after implementation.
- Active modes (walking and cycling) and shared mobility solutions continued to represent a minor share.
- Main travel purposes remain work and education, and first trips concentrated in morning peak period.

No substantial modal shift can yet be attributed to the project measures, which is consistent with the short implementation timeframe.





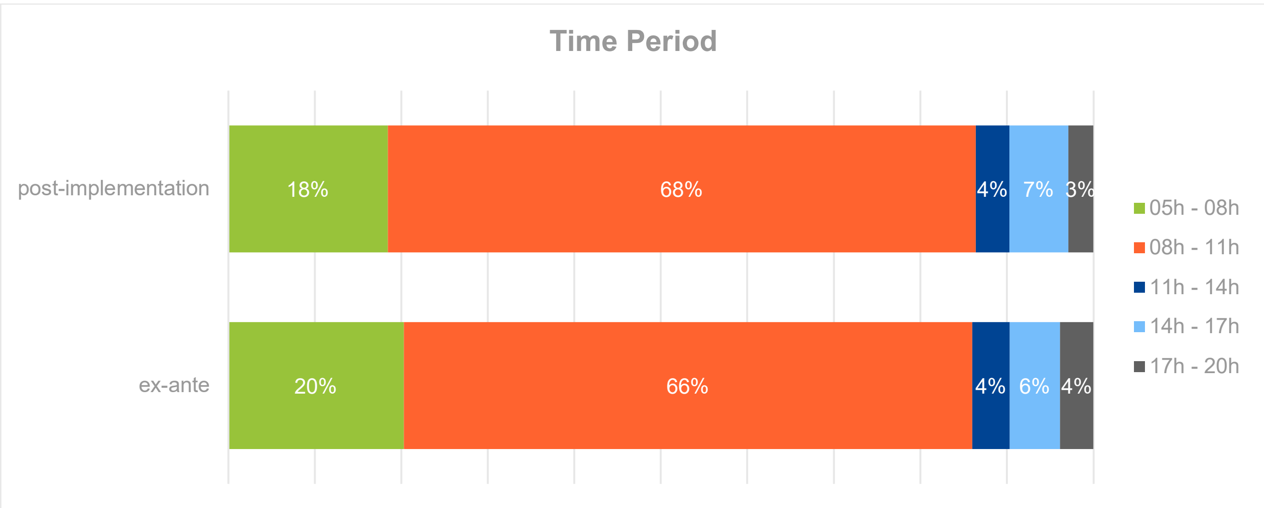


Figure 25 Travel behaviour and modal split (Coimbra)

Satisfaction with the existing transport system

Regarding satisfaction with the existing transport system, the ex-ante and post-implementation surveys indicate a moderate level of satisfaction, which remains relatively stable over time.

The social acceptance survey showed a slight improvement in satisfaction. However, as most responses in this survey were collected in person, the results may be subject to response bias and should therefore be interpreted with caution.

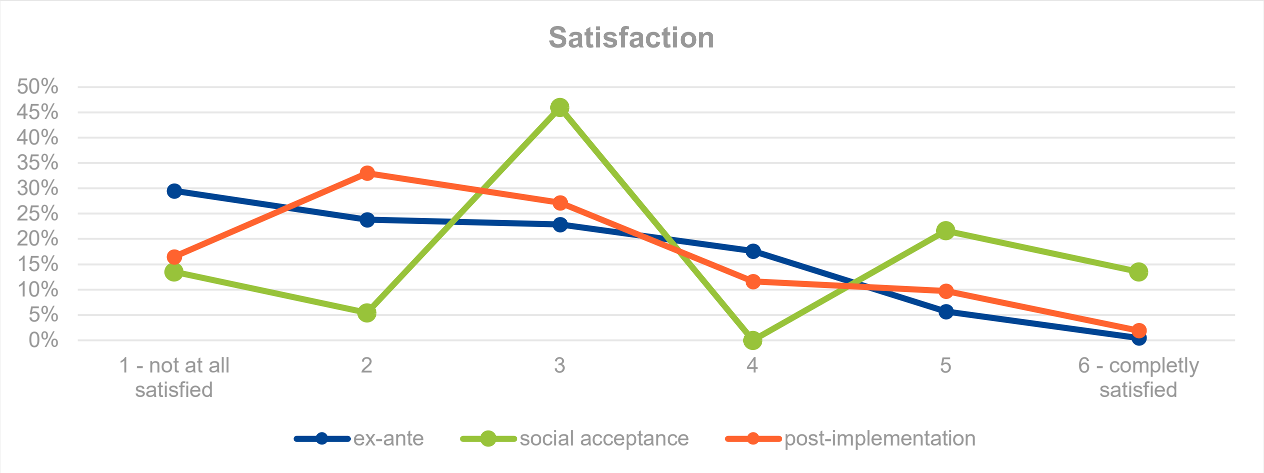


Figure 26 Satisfaction with the existing transport system (Coimbra)

Acceptance of transport policies

Regarding the implemented transport policies, the surveys indicate:

- A moderate level of acceptance of new mobility policies across all surveys.
- No strong resistance was detected, but neither was there an enthusiastic endorsement.
- Acceptance levels remained relatively stable, suggesting that the project measures and the broader mobility changes in the municipality were not perceived as disruptive, but had not yet generated strongly perceived benefits among the population.

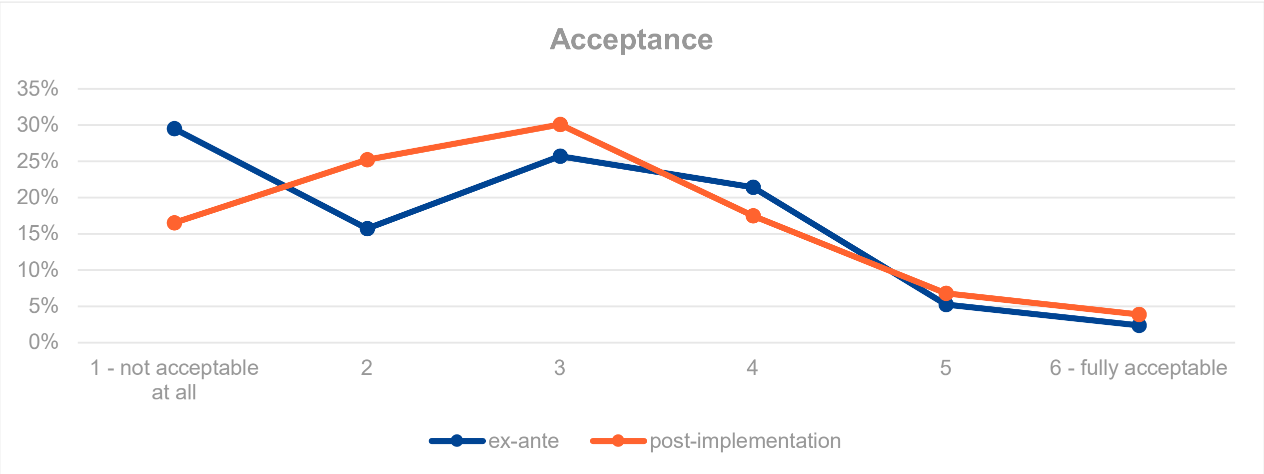


Figure 27 Acceptance of transport policies (Coimbra)

Flexible Passenger Transport Service

The Flexible Passenger Transport Service, launched on 16 September 2024, was assessed using operational supply and demand data, covering both:

- Peak-hour services operating with fixed routes and schedules; and
- On-demand services operating between peak periods.

Peak hour operations

Between September 2024 and March 2026, a total of 4,428 trips were planned, of which 2,696 were performed.

Table 9 Planned and Performed Trips Between September 2024 and March 2026 (Coimbra)

	2024		2025		2026	
	planned	performed	planned	performed	planned	performed
jan			264	264	252	
feb			240	216	216	
mar			240	204	264	174
apr			228	222		
may			252	186		
jun			228	186		
jul			264	264		
aug			240	18		
sep	132	118	252	120		
oct	276	276	168			
nov	240	234	240	6		
dec	228	208	204			

A total of 10,507.53 km was operated in service. In addition, the operator reported 10,211.59 km of empty running, representing almost the same distance as operated service kilometres, indicating low operational efficiency.

Regarding demand, a total of 1,849 passengers were transported during peak hour operations. Demand remained relatively low throughout the monitoring period, including 13 passengers recorded in March 2026.

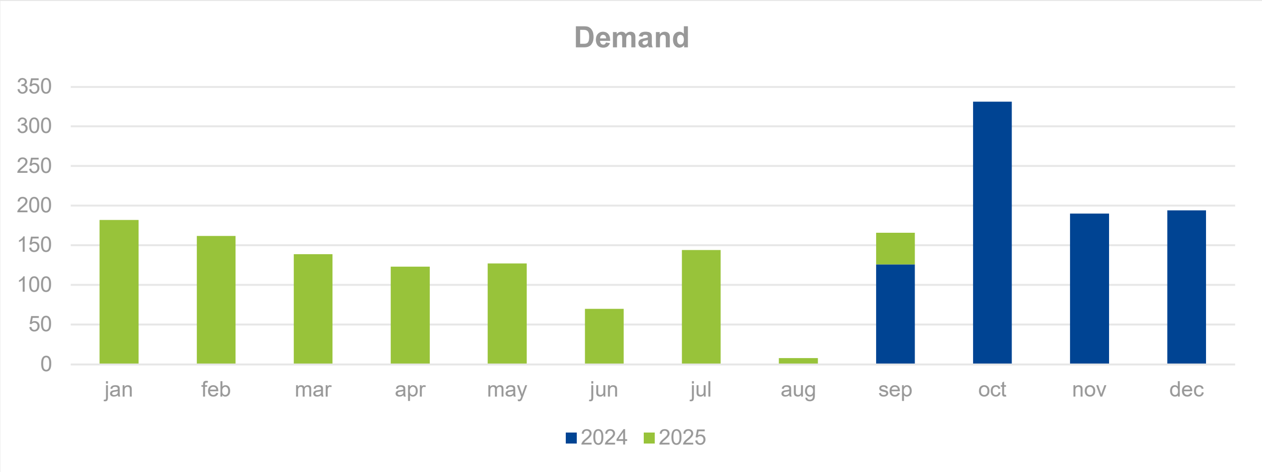


Figure 28 Monthly Demand for the Flexible Passenger Transport Service (2024–2025) (Coimbra)

On-demand operations (between peak hours)

A total of 57 bookings were registered for the on-demand service. However, these resulted in only 43 trips performed as 5 bookings were cancelled by passengers, and 9 bookings were rejected due to resources unavailability related to strikes.

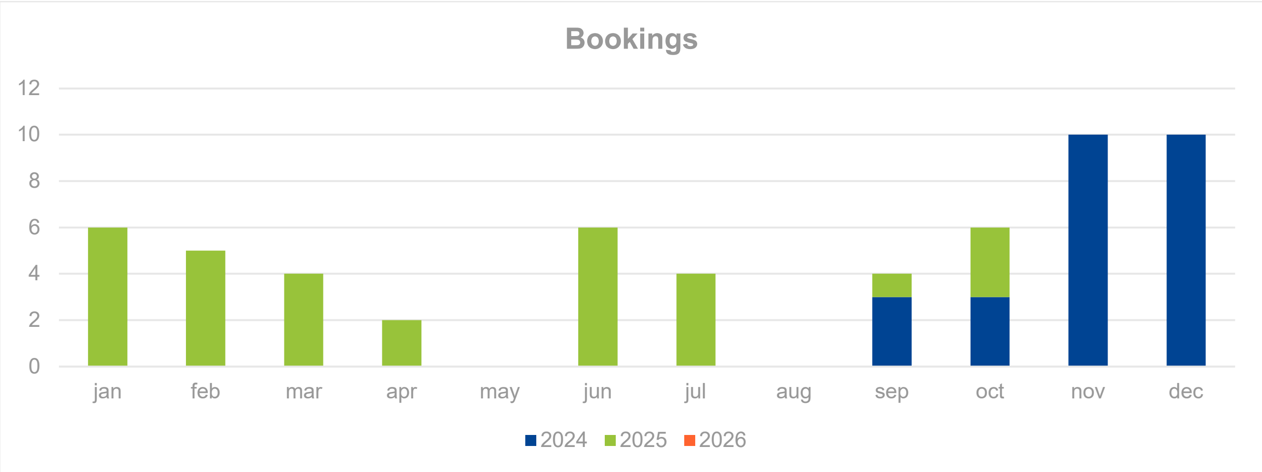


Figure 29 Monthly Number of Bookings for the on-demand transport (2024–2026) (Coimbra)

It should be noted that the service started in September 2024, with the first on-demand trip performed on the 18th of September.

Of the 43 trips performed, 2 involved passenger no-show, and 41 completed trips transported 41 passengers, corresponding to one passenger per trip.

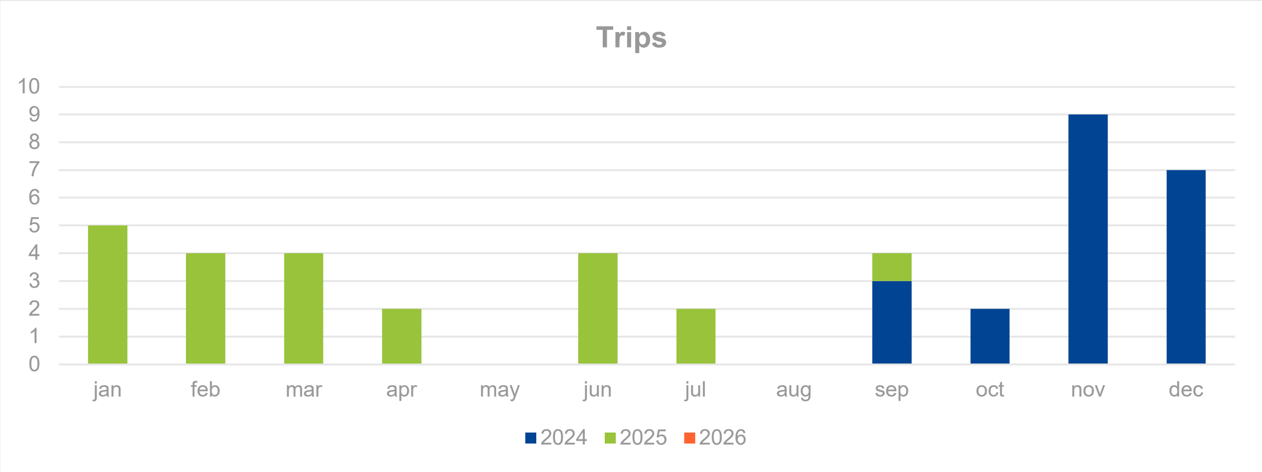


Figure 30 Monthly Number of Trips for the Flexible Passenger Transport Service (2024–2026) (Coimbra)

User awareness, perceived convenience and intention to use

Across social acceptance and post-implementation surveys, the share of respondents who had used the flexible passenger transport service remained very low, although a slight increase was observed in the final survey.

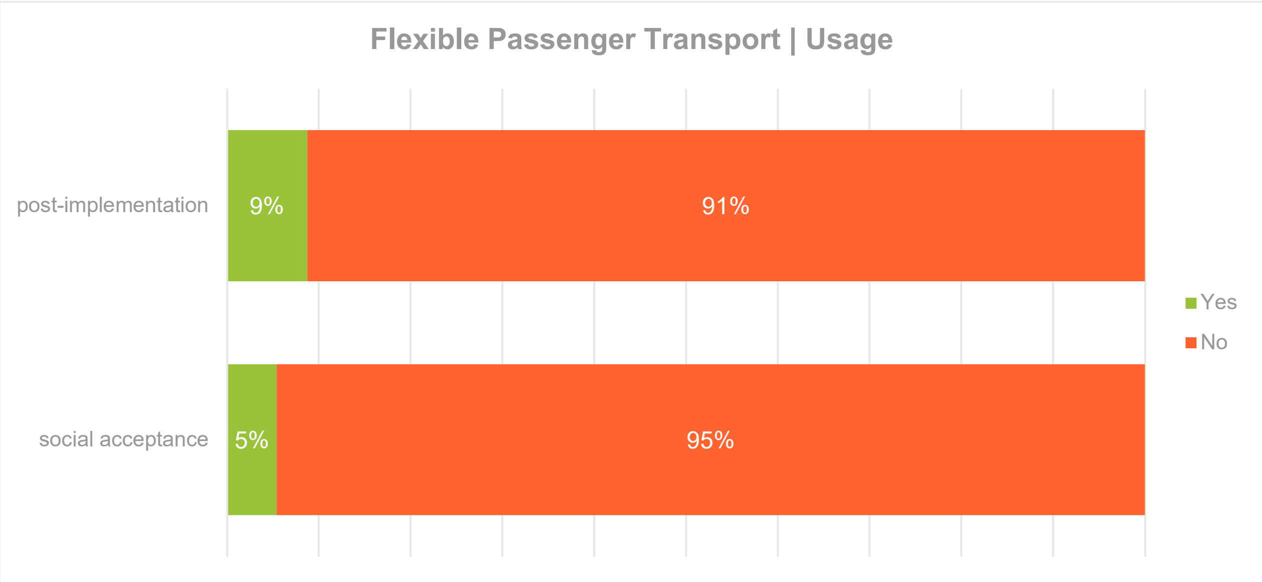


Figure 31 Usage of the Flexible Passenger Transport Service - Before and After Implementation (Coimbra)

Among non-users, respondents generally did not perceive the service as sufficiently convenient for their daily mobility needs. As perceived convenience is a key determinant of intention to use, the low intention-to-use results are consistent with this finding.

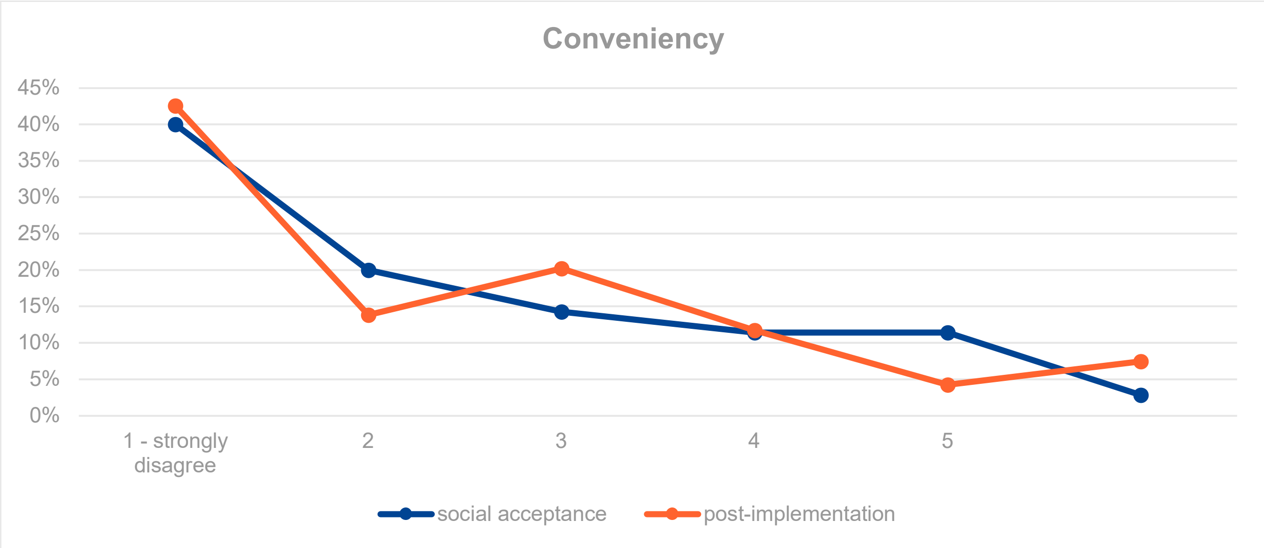


Figure 32 Perceived Convenience of the Flexible Passenger Transport Service – Before and After Implementation (Coimbra)

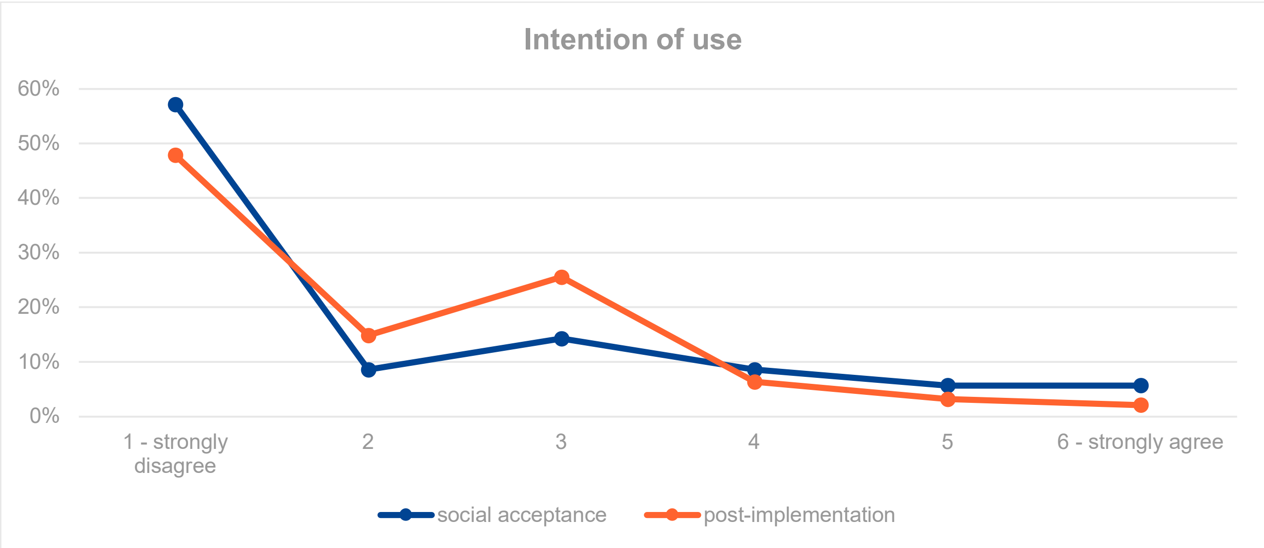


Figure 33 User Intention to Use the Flexible Passenger Transport Service – Before and After Implementation (Coimbra)

Regarding ease of usage, respondents generally agreed that the service is easy to understand and does not require significant learning effort.

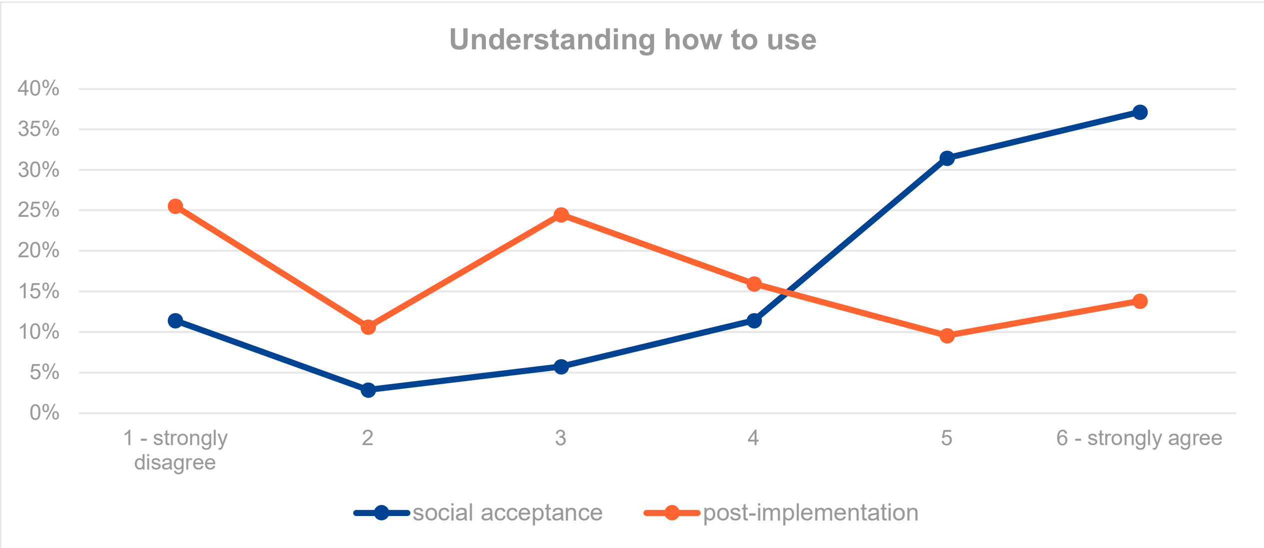


Figure 34 User Understanding of How to Use the Flexible Passenger Transport Service – Before and After Implementation (Coimbra)

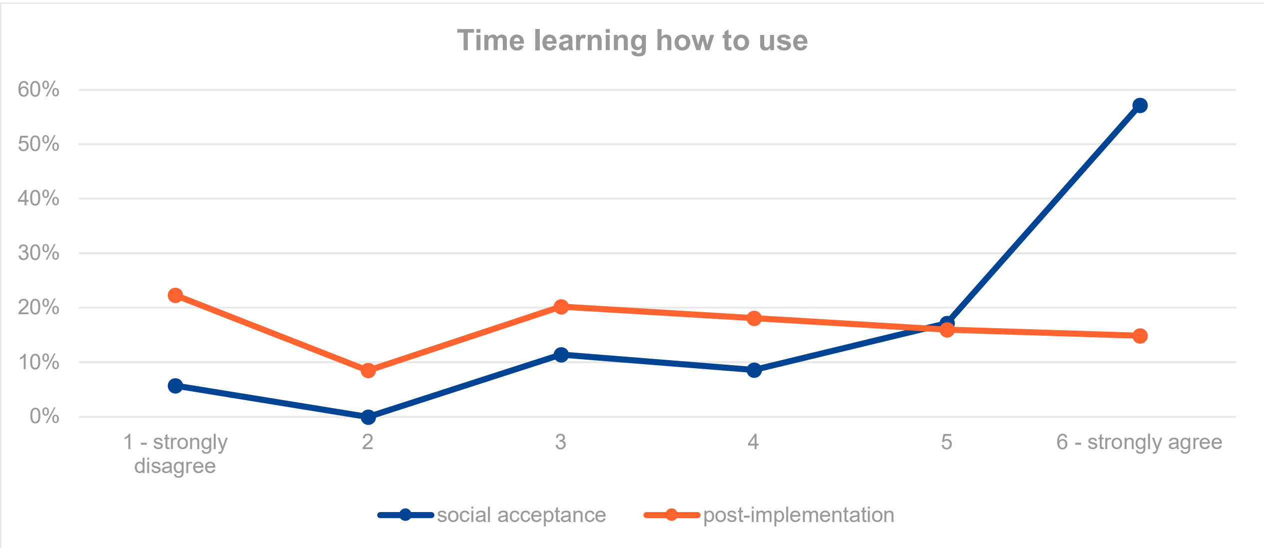


Figure 35 Time Required to Learn How to Use the Flexible Passenger Transport Service – Before and After Implementation (Coimbra)

Qualitative findings from interviews

Interviews conducted alongside the social acceptance and customer surveys provided additional insights into perceptions and barriers:

- When the service is clearly explained, participants generally understand how it works and state that they might use it if the need arises.
- Young participants tend to perceive the service as particularly useful for elderly people, mainly due to timetable flexibility and accessibility.
- Elderly participants, in contrast, perceive the service as more useful for younger people, especially because of how booking and operation mechanisms work.

3.5.4 Fredrikstad

Contextual results (municipal travel behaviour surveys)

The repeated municipal travel behaviour surveys conducted by NORCE and SINTEF provide a stable contextual and baseline reference for the Fredrikstad Follower Living Lab. Across the three survey waves (FRVU21, FRVU22 and FRVU24), a total of 4,211 telephone interviews were completed between autumn 2021 and spring 2025 using a consistent CATI methodology.
The surveys capture overall travel behaviour patterns and mobility attitudes in the municipality, including cycling, public transport use and perceptions related to sustainable mobility. While these surveys are not designed to measure the direct causal impact of SUM measures, they provide an important contextual backdrop for understanding broader mobility trends and user perspectives in Fredrikstad during the Living Lab period. As such, the FRVU results are used as baseline and context indicators against which demonstration-related insights can be interpreted.

Table 10 Provides an overview of the main data sources used for the evaluation of the Fredrikstad Living Lab

Data source	Method	Scope / sample	Purpose
Municipal travel behaviour surveys (FRVU21, FRVU22, FRVU24 – NORCE/SINTEF)	CATI telephone interviews	4,211 respondents (2021–2025)	Contextual and baseline indicators on mobility behaviour and attitudes
Living Lab–specific ferry passenger survey	In situ onboard intercept survey (QR-code access on board)	n = 141 voluntary responses	Demonstration-related user experience: satisfaction, intermodality, usability and improvement needs
Operational pilot documentation (Hyke F-15 Shuttle)	Operational logging and reporting	Pilot period April 2024 – August 2025	Technical, operational, and organisational learning under real operating conditions
Regional mobility data monitoring (Bypakke Nedre Glomma)	Aggregated administrative data	Monthly updates	Supports continuity and coordination of monitoring across actors

Demonstration-related results (Living Lab–specific user survey)

Demonstration-specific data were gathered through an in situ onboard intercept survey among ferry passengers in Fredrikstad, using QR-code access on board the vessels. The survey yielded 141 responses and focused on aspects related to the demonstrated measures, including user satisfaction, perceived intermodality, and service usability.
The collected data indicate high satisfaction with the ferry service as part of the local public transport system. Respondents highlighted the ferry as a convenient and reliable mode, particularly for short cross-river trips and for combining walking and cycling with water-based transport. Perceived ease of transfers between the ferry and other modes (bus, walking and cycling) emerged as a key factor influencing overall satisfaction.

The survey also explored the suitability of the ferry for commuting purposes. A substantial share of respondents reported regular or frequent use, suggesting that the service functions not only as a leisure mode but also as part of everyday mobility. Users pointed to timetable coordination, waiting times at quays, and clarity of information as key factors for continued and increased use.

A dedicated bike-sharing module provided additional insights into conditions for potential integration of shared bicycles with the ferry service. Survey responses indicate interest in e-bikes and flexible return systems (e.g. return to any station), with pricing, availability, and ease of access identified as decisive factors for potential uptake. These findings are indicative rather than statistically representative but provide concrete signals relevant for further development of intermodal solutions.

Synthesis of gathered data

Taken together, the gathered data allow Fredrikstad to combine a robust municipal mobility context with targeted, user-centric insights linked directly to the demonstrated ferry-based measures. The municipal survey framework situates the Living Lab within longer-term mobility patterns and attitudes, while the Living Lab-specific survey captures practical experiences, perceived benefits, and improvement needs related to intermodality and service use.

This synthesis is based on the in-situ onboard survey (n = 141) and operational pilot documentation, which together indicate high user satisfaction and highlight transfer quality, waiting times and information clarity as key drivers of perceived usefulness and continued use.
The results confirm the relevance of ferry-based mobility as part of an integrated urban transport system in Fredrikstad and underline the importance of transfer quality, information provision, and service coordination. These findings form the empirical basis for the subsequent section on lessons learned and transferability, and support dialogue on how demonstrated measures can be improved, consolidated, and potentially scaled within the local public transport system.

Overall, the findings indicate that ferry-based mobility is perceived as a reliable and well-functioning component of the local public transport system. In particular, the results highlight the importance of transfer quality, coordination between modes, and clarity of information as key drivers of user satisfaction and continued use

Link to broader data initiatives

During the project period, the need to collect, structure, and communicate relevant mobility data was further highlighted through the Fredrikstad Living Lab activities. This development is aligned with existing and ongoing data collection initiatives led by Fredrikstad municipality and the Bypakke Nedre Glomma framework, including repeated municipal travel behaviour surveys and regional travel habit studies.

In parallel, these needs have been reflected in the development of a shared regional mobility data portal under Bypakke Nedre Glomma, aimed at improving transparency, accessibility, and coordination of mobility data across actors. While not developed as part of SUM alone, the Living Lab work provided relevant context and user-oriented perspectives that are consistent with and supportive of this broader data infrastructure.

3.5.5 Larnaca

Summary of Key Changes

The Larnaca Living Lab observed significant shifts between Round 1 (baseline, 2024) and Round 2 (post-implementation, 2026) across all monitored indicators. The figure below summarises the key changes:

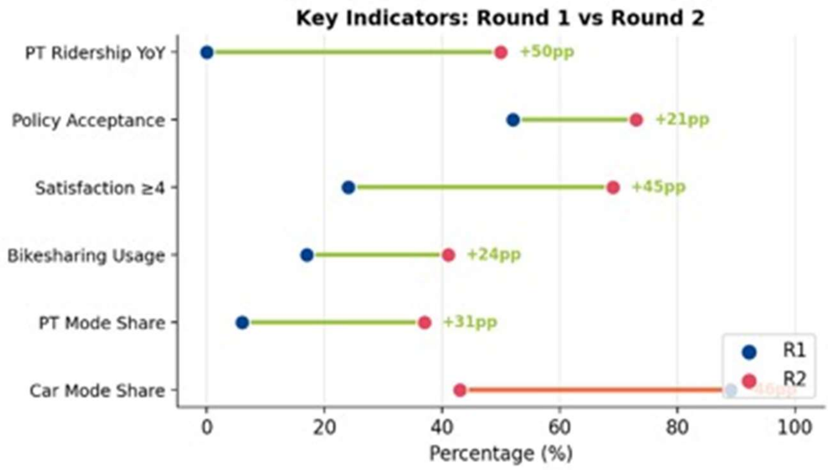


Figure 36 Key indicator changes between Round 1 and Round 2. Green arrows indicate improvement; orange indicates shift requiring monitoring.

Quantitative Results: Modal Shift

The most significant finding is the dramatic modal shift away from private car use. Car mode share (driver + passenger) dropped from 89% in R1 to 43% in R2 — a 46 percentage-point decrease. This was accompanied by a rise in public transport from 6% to 37%, and bicycle/e-bike use from 0.5% to 10%.

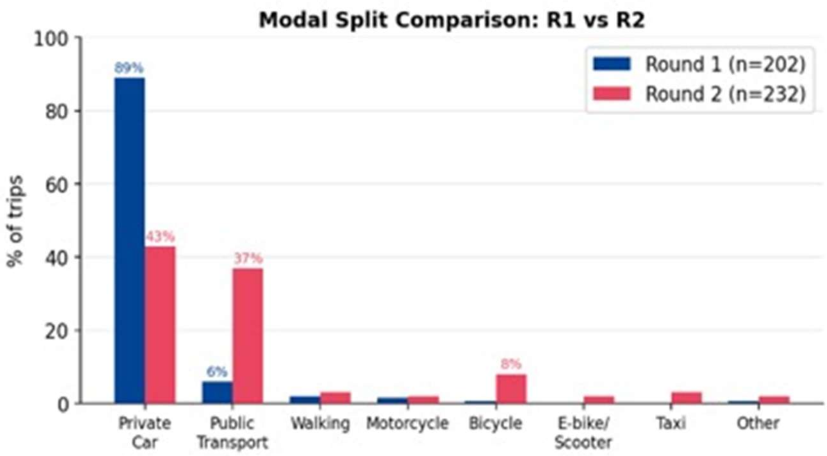


Figure 37 Modal split comparison between Round 1 and Round 2.

While part of this shift may reflect sampling differences (R2 was reached in a broader population), the magnitude and consistency across all indicators suggest genuine behavioural change driven by the implemented measures.

Transport Satisfaction & Policy Acceptance

Transport satisfaction improved markedly. The share of respondents rating satisfaction at 4 or above (on a 1–6 scale) increased from 24% in R1 to 69% in R2 — a near-tripling. Policy acceptance for recent transport measures reached 73% in R2.

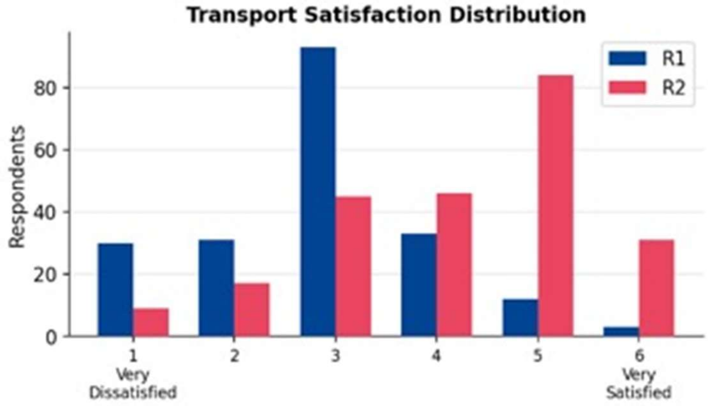


Figure 38 Transport satisfaction distribution (1=very dissatisfied, 6=very satisfied).

Bikesharing & Micro-Mobility

Bikesharing adoption grew significantly. In R2, 41% of respondents reported having used bikesharing services, compared to 17% shared mobility usage in R1. Among bikesharing users, satisfaction scores were notably high: ease of use 4.94/6, convenience 4.77/6, and continued use intention 4.87/6.

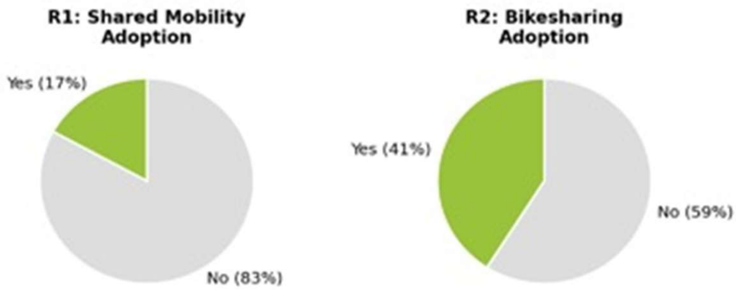


Figure 39 Shared mobility / bikesharing adoption: R1 vs R2.

Public Transport Ridership Growth

LPT ridership data for routes 417 & 421 confirms a sustained growth trajectory. Annual passengers grew from 786 in 2020 to 8,838 in 2025 — a more than tenfold increase over five years. The 2024–2025 growth rate of 50.1% is the strongest year-on-year increase, coinciding with frequency enhancement measures. Early 2026 data (January–February) shows a further 25% increase over the same period in 2025.

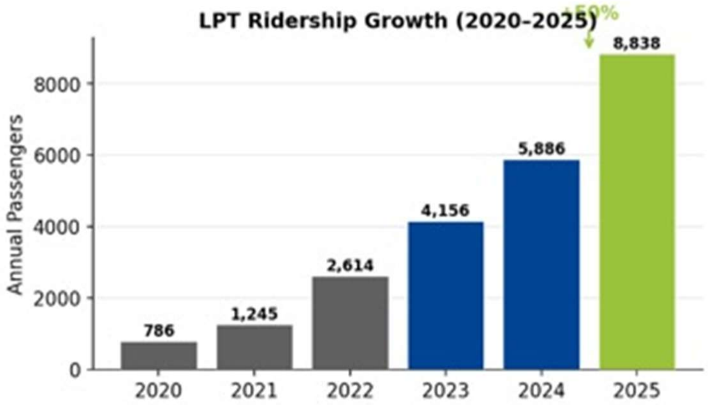


Figure 40 LPT annual ridership, 2020–2025

Simulation Results: Parking Restriction

Simulation modelling (SUMO) of the Skala parking restriction scenario produced the following results:

Table 11 Parking Restriction Simulation Results.

Indicator	Result
Traffic volume reduction (Skala)	15%
CO_2 emissions reduction	12.4%
Average speed improvement	+8%
PT mode shift (simulated)	+4.2 pp
Parking search time reduction	62%

Spatial Analysis: Synthetic OD Patterns

To enable spatial comparison between rounds, a hybrid statistical matching and gravity model approach was developed to impute geographic origins and destinations for R2 respondents (who only provided activity-based OD data). The methodology assigned 478 trips across 35 zones with 90% high-confidence matches.

The synthetic OD analysis confirms Skala's role as the primary trip attractor (32% of all destinations), with the top 15 OD flows showing strong consistency with R1 observed patterns. Mean synthetic trip distance is 4.4 km (median 2.7 km), consistent with Larnaca's compact urban form.

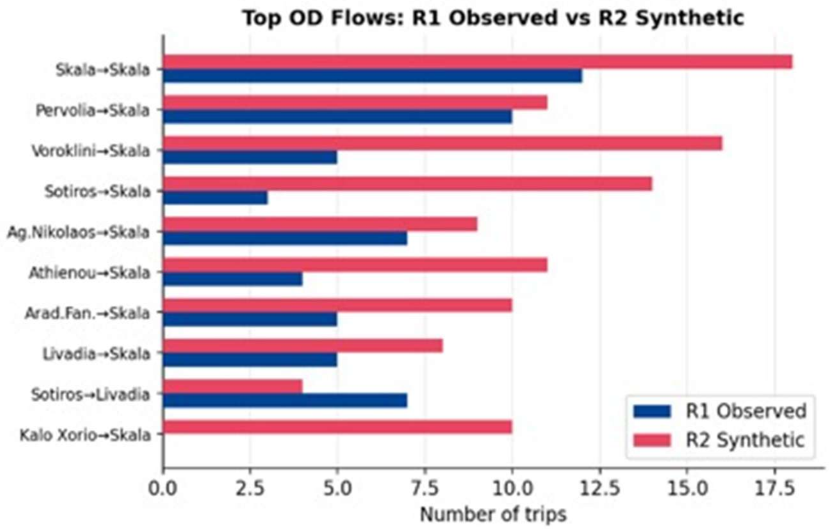


Figure 41 Top OD flows: R1 observed vs R2 synthetic allocation.

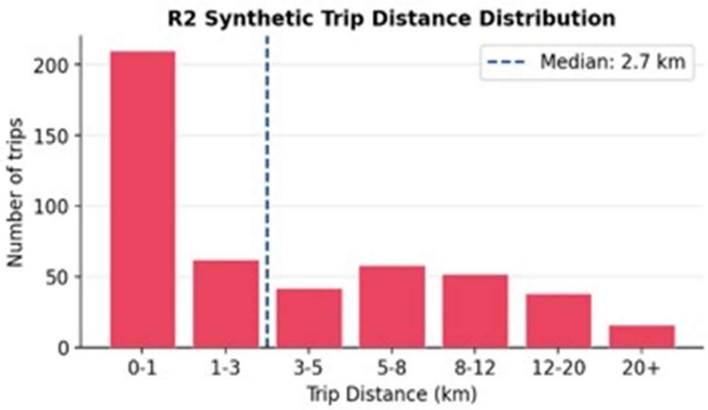


Figure 42 R2 synthetic trip distance distribution (478 trips).

Qualitative Findings

Beyond quantitative metrics, several qualitative insights emerge from the survey data and stakeholder engagement:

Safety perceptions shifted significantly. R2 respondents reported higher perceived crime risk across all modes (average 3.6–4.2/6 vs 2.2–2.9/6 in R1), suggesting increased awareness rather than deterioration. Road accident risk perceptions converged between modes, with walking and PT now perceived as equally risky as car travel.

E-bus interest is high. 60% of R2 respondents rated electric buses as useful (5–6/6), and 57% indicated they would use them frequently. This provides strong demand-side evidence for the planned e-bus deployment.

Social norm effects are emerging. Agreement with "people around me think I should use public transport" increased from R1 to R2, suggesting that mode shift is becoming socially reinforced — a positive feedback loop for sustained behavioural change.

3.6 Replicability, Lessons Learned and Best Practices

3.6.1 Krakow

The implementation of the LajkBus service in Krakow provides valuable insights into the potential for scaling demand-responsive transport solutions in other urban areas. The results indicate that this type of service can be effectively transferred to other cities, particularly in peripheral or low-density areas where conventional public transport is difficult to operate efficiently.

The experience gained in Krakow demonstrates that demand-responsive transport can significantly improve accessibility and complement existing public transport systems. A key success factor was the strong integration with public transport, especially in terms of ticketing and connectivity with major interchange hubs. This integration ensured that the service was perceived not as a standalone solution, but as part of the broader mobility system.

An important element of this integration was the role of the Czerwone Maki interchange hub, which served as a primary transfer point between the LajkBus service and the core public transport network, including tram and bus lines. This allowed passengers from less densely populated areas to efficiently connect to high-capacity transport modes, significantly improving overall journey continuity. The use of a well-functioning interchange hub enhanced the attractiveness of the service and reduced travel times, making the system more competitive with private car use.

User behaviour and feedback highlighted the importance of flexibility, ease of use, and reliability. The possibility to book rides on demand, combined with predictable travel times and integration with existing ticketing systems, contributed to high user acceptance. At the same time, the project revealed several operational challenges, particularly related to peak-hour demand, capacity limitations, and the need for continuous optimisation of routing algorithms.

These challenges were addressed through iterative improvements, including adjustments to algorithms, ongoing monitoring of demand patterns, and consideration of increasing fleet capacity. The project also demonstrated the importance of continuous data collection and user feedback in refining the service.

Another important lesson learned is the value of stakeholder cooperation and co-creation processes. The involvement of public authorities, technology providers, and research institutions enabled a comprehensive approach to service design and implementation. Equally important was the active engagement of local authorities and residents, whose participation and feedback played a crucial role in shaping the service, increasing its acceptance, and ensuring that it responded effectively to real mobility needs.

Overall, the Krakow Living Lab confirms that demand-responsive transport services can play a significant role in enhancing urban mobility systems, provided that they are well integrated, data-driven, and user-oriented. The inclusion of efficient interchange hubs, such as Czerwone Maki, as well as strong involvement of local stakeholders, further strengthens the effectiveness and transferability of such solutions.

3.6.2 Rotterdam

Lessons learned

Creating a win-win-win situation for all involved parties cannot be achieved overnight. It requires time to build mutual trust, properly understand each other's interests, and develop solutions that create value for everyone. Consistency in approach, communication, and decision-making plays a crucial role in this process. By maintaining a steady focus on shared objectives and being transparent throughout, a sustainable collaboration emerges in which all parties feel heard and supported. Keeping track on time, the availability of resources and planning those ahead in time is critical.

Sharing data among different stakeholders requires a high level of transparency and clearly defined agreements. All parties need to understand what data is being shared, for what purpose, and under which conditions. In addition, it is essential that these agreements are properly supported by legal frameworks, clarifying responsibilities, ownership, and usage rights. This helps prevent misunderstandings and risks, while fostering trust between organizations.

When planning complex projects, it is advisable to anticipate possible delays. By deliberately incorporating buffers into the planning, unforeseen circumstances can be handled more effectively without immediately leading to stressful deadlines or compromising quality. This built-in flexibility allows teams to respond more effectively to challenges and ensures that there is sufficient time to develop solutions properly. Ultimately, this results in a more realistic planning process and a more stable project execution.

Actively engaging and keeping all stakeholders involved is essential for the success of a project. This requires regular communication about progress, challenges, and results. At the same time, it is important to manage expectations carefully—clearly outlining what can be delivered, when it can be delivered, and what limitations or trade-offs may exist.

Overall, the project delivered strong results in developing the model, setting up the required APIs, and creating a user-friendly interface within the RET app. These components were successfully integrated into one cohesive solution, allowing users to easily access and benefit from the functionality. This demonstrates a solid alignment between technical development, system integration, and user-centered design.

Transferability

The developed solution is not only valuable within the context of this project but also offers clear opportunities for broader application. Siemens will incorporate the functionality as a service within its wider product portfolio, while RET intends to contract the service for the coming years. Furthermore, the model has been designed in such a way that it can be relatively easily adopted by other organizations, both within the Netherlands and internationally.

3.6.3 Coimbra

Prior to the implementation of the flexible passenger transport service, the Coimbra Living Lab identified the following risks and corresponding contingency measures:

Table 12 Identified Risk (Coimbra)

Identified Risk	Responsible Partner	Contingency Plan
High costs and complexity of developing the dedicated digital platform	Transport Authority	Use of national financial support mechanisms for Transport Authorities
Driver shortage	SMTUC	Review and optimization of the overall public transport network
Delays in the development of the Sustainable Urban Mobility Plan (SUMP)	Municipality of Coimbra	Progressive implementation of mobility measures where feasible

Following the implementation of the flexible passenger transport service, additional risks and challenges were identified. On the user side, low awareness of the service resulted in limited demand. On the operator side, driver shortages, vehicle malfunctions and delays caused by roadworks affected service reliability.

At the outset of the project, a key assumption was that demand-responsive transport services would quickly attract users once technically deployed. However, the pilot demonstrated that technological readiness alone is insufficient to ensure user uptake. Communication and user engagement emerged as critical factors, highlighting the importance of early and sustained awareness-raising efforts.

Another key lesson concerns the central role of service reliability in building user trust. Integration with the conventional public transport network requires not only timetable coordination but also robust operational alignment, particularly when external factors such as roadworks affect system performance.

From a technical perspective, the combination of digital and non-digital booking solutions proved essential. While digital tools offer efficiency and scalability, telephone-based support remains crucial for elderly users and digitally excluded populations.

The pilot also highlighted the value of early and broad stakeholder involvement, including local communities and end users, in the design phase. Co-creation approaches were instrumental in identifying local needs, building trust and improving service relevance. These governance and cooperation practices represent a key best practice for future implementations of shared and flexible mobility solutions in complex urban contexts.

3.6.4 Fredrikstad

Fredrikstad – Replicability, Lessons Learned and Best Practices

This section summarises key lessons learned, transferability, risks, and mitigation measures, as well as governance and cooperation aspects derived from the Fredrikstad Follower Living Lab. The insights are based on practical implementation experience under real-world municipal conditions and are intended to support learning and replication in other cities.

Table 13 Key lessons learned and transferability – Fredrikstad Living Lab

Area	Lesson learned	Relevance for other cities
Data & evaluation	Combining existing municipal surveys with targeted in-situ user data provided sufficient insight without extensive new data infrastructures	Relevant for follower cities with limited evaluation capacity
Intermodality	Perceived transfer quality (information, waiting time, coordination) strongly influenced perceived usefulness	Highly relevant for cities integrating shared mobility with public transport
Governance	Continuity depends on early anchoring within the organisation, clearly defined institutional ownership, and proactive handling of organisational change.	Applicable to most municipal Living Labs operating over multiple years
Co-creation	Cross-disciplinary collaboration (municipality–academia–operator) strengthened learning quality and implementation relevance	Relevant for cities working with universities and private mobility operators

Transferability to other cities and regions

A key transferable insight from Fredrikstad is that meaningful Living Lab learning can be generated by combining (i) an established municipal travel behaviour survey framework with (ii) targeted, measure-relevant in-situ user insights. In Fredrikstad, repeated municipal travel behaviour surveys conducted with research partners (NORCE/SINTEF) have provided robust contextual and baseline indicators, while a Living Lab–specific onboard intercept survey captured demonstration-relevant user experience and intermodality-related signals. This "context + targeted insights" approach is replicable for follower cities that have limited capacity to establish entirely new data infrastructures but are able to leverage existing municipal or regional data sources and complement them with focused user feedback.
A second transferable lesson relates to intermodality. The Fredrikstad experience shows that even when a core public transport service is well established, the perceived quality of transfers—such as information clarity, waiting times, and coordination between modes—can be decisive for perceived usefulness and continued use. Follower Living Labs can therefore prioritise targeted interventions aimed at improving transfer quality as a practical and scalable approach.

Risks and mitigation measures

- **Resource continuity and role changes**

Multi-year Living Lab activities are exposed to changes in staffing, roles, and resource availability. In Fredrikstad, this risk was mitigated through deliberate organisational anchoring, including clear ownership, distribution of responsibilities, and structured documentation, rather than reliance on individual contributors.

- **Mismatch between Grant Agreement expectations and implementation reality**

A recurrent risk is that assumptions made at proposal stage do not fully align with operational realities at the time of implementation. In Fredrikstad, a dedicated post-implementation acceptance survey as foreseen in WP1 was not conducted. Instead, a context-driven decision was taken to rely on established municipal survey infrastructure and targeted Living Lab surveys, reflecting that the demonstrated mobility services formed part of ordinary municipal service delivery. The mitigation approach was transparent deviation management, documenting the rationale and avoiding claims of direct replacement of harmonised WP1 acceptance surveys.

- **Competing municipal priorities and political re-direction**

Municipal Living Labs operate within political and administrative decision cycles that may require reprioritisation of resources and activities. In Fredrikstad, mitigation focused on maintaining a clear scope baseline, documenting changes and their rationale, and re-aligning Living Lab activities with updated policy guidance while safeguarding core deliverable commitments.

- **Cross-work package dependencies and deliverable bottlenecks**

Living Lab reporting often lies on the critical path for other work packages. Dependency-related risks were mitigated through early alignment on minimum acceptable evidence ("definition of done"), continuous maintenance of a limited core set of indicators, and the use of annexes for supplementary material where appropriate.

Technical, organisational, and operational lessons learned

- **Maintaining engagement over time**

Initial assumption: standardised evaluation approaches would be feasible as planned
In practice, the feasibility and relevance of some evaluation elements depended on local service governance and municipal operating conditions. A key lesson is the need to distinguish early between mandatory harmonised reporting requirements and elements that can be adapted with justified deviations, and to document such adaptations proactively.
Initial assumption: data availability and responsibilities would remain stable

Over the project period, data access arrangements and responsible actors may change. The Fredrikstad experience underlines the importance of early agreement on data and KPI ownership, update frequency, and formats, as well as keeping the KPI set proportionate and manageable.

- **Operational lesson: lightweight, targeted user data can be highly actionable**

The in-situ ferry passenger survey was not designed for full statistical representativeness but provided actionable insights into satisfaction drivers and improvement needs, particularly related to transfer quality, information provision, and conditions for bike-sharing integration. This demonstrates that focused data collection can still support robust learning and reporting for follower cities.

- **Operational lesson: early involvement of operational actors improves feasibility**

Earlier involvement of operational stakeholders—such as service operators and those responsible for daily operations and customer-facing information—improves feasibility, timing, and implementation quality, and reduces the risk that Living Lab insights remain at project level only.

- **Governance and cooperation aspects**

Sustained engagement across municipal departments and partner organisations proved critical throughout the Living Lab period, particularly in phases where resources fluctuated, roles changed, or political and administrative priorities shifted. In the Fredrikstad context, Living Lab activities were embedded in an ongoing planning and implementation landscape, including the development of a local Sustainable Urban Mobility Plan (SUMP) framework and the preparation and adoption of the street network and street use plan. This increased both relevance and complexity, as Living Lab work had to remain aligned with parallel formal planning processes.
Engagement was strengthened through regular re-anchoring of objectives, explicit prioritisation, and shared ownership across disciplines such as planning, operations, data and analytics, and communications. Rather than relying on individual project champions, continuity was supported by deliberately distributing responsibilities and ensuring that Living Lab insights were connected to ordinary municipal workflows and decision cycles. This approach reduced vulnerability to staff turnover and organisational change and increased the likelihood that learning from the Living Lab could be retained and reused beyond the project period.

- **Expectation management and clarity on deliverables**

A key governance lesson from Fredrikstad is the importance of continuous expectation management—internally and with project leadership—regarding what constitutes sufficient evidence for deliverables, how local context may justify deviations from proposal assumptions, and where different types of documentation best belong within the wider SUM project structure. In a municipal setting characterised by formal planning obligations, political decision-making and external statutory requirements, not all evaluation elements foreseen at proposal stage were equally feasible or relevant as standalone project activities.

Clear delineation between mandatory harmonised project requirements, context-adapted evaluation approaches, and supplementary material proved essential. This included explicit agreement on what could be documented through existing municipal data infrastructures and planning processes, and what would remain outside the scope of the Living Lab deliverable while still being available upon request. Transparent framing of such choices helped maintain trust, avoid over-claiming, and ensure that the Fredrikstad contribution was perceived as credible and robust within WP4.

- **Cross-disciplinary collaboration and co-creation as a best practice**

The Fredrikstad Living Lab demonstrates the value of structured cross-disciplinary collaboration involving municipal departments, academic partners, and private mobility operators, supported by broader stakeholder dialogue through established planning processes. Cooperation with Chalmers University of Technology contributed methodological reflection and an external, user-centred analytical perspective, while close collaboration with the private mobility provider Hyke during the F-15 Shuttle pilot enabled mutual learning under real public transport operating conditions.

In parallel, the Living Lab benefitted from governance and co-creation mechanisms developed through the street network and street use planning process, including public hearings, open public meetings, targeted dialogue with affected actors and transport operators, and walk-throughs with political leadership prior to formal decision-making. While not initiated solely for the Living Lab, these processes provided a tested framework for stakeholder involvement, expectation alignment, and conflict management, and helped situate Living Lab activities within a broader culture of participation and transparency.

For the municipality, this collaboration provided practical insight into embedding innovative, commercially developed mobility solutions within existing public transport and street management regimes, including implications for reliability, operational responsibility, regulatory constraints, and passenger communication. For private operators, the Living Lab offered experience with public sector governance, long-term service continuity requirements and the interaction between pilot services and formal planning instruments. Together, these experiences illustrate how continuous dialogue, clear role definitions, and flexible but structured coordination are essential for successful public–private integration of new mobility solutions in a municipal context.

3.6.5 Larnaca

The Larnaca Living Lab provides valuable insights into the implementation of integrated, multimodal mobility solutions, with strong potential for transferability to other cities with similar characteristics, particularly medium-sized, car-dependent urban areas.

The implementation approach, structured around key business activities such as MaaS integration, shared mobility deployment, incentive schemes, and public transport optimisation, can be transferred and adapted to other contexts. The modular nature of these interventions allows cities to replicate individual components based on local priorities, infrastructure readiness, and policy frameworks. In particular, the integration of public transport and micromobility through a single digital platform, combined with supportive policy measures, represents a scalable model for promoting multimodal mobility.

Several risks were identified during implementation. A key challenge was that certain policy-related measures, such as parking restrictions, extend beyond the project timeframe in terms of implementation and depend on long-term municipal planning frameworks. This highlights the importance of aligning project activities with broader policy instruments, such as SUMP, to ensure continuity and impact.

Additional risks included coordination complexities among multiple stakeholders and the integration of different data systems. These were mitigated through continuous collaboration, stakeholder engagement, and incremental (phased) implementation approaches.

From a technical perspective, the integration of transport modes (bus and bikesharing) into a MaaS platform requires interoperable systems, reliable data exchange, and continuous system improvements to maintain user trust.

Organisationally, early assumptions that different stakeholders could be easily aligned proved challenging in practice. Effective coordination required structured governance, clear roles and responsibilities, and frequent communication among partners, including public authorities, operators, and service providers.

Operationally, it became evident that behavioural change takes time and requires continuous support. User adoption depended not only on service availability but also on awareness campaigns, incentives, and ease of use. In this context, pilot-based implementation and ongoing user feedback were essential in refining services and improving their effectiveness.

The Living Lab highlighted the critical role of governance in the successful implementation of integrated, multimodal mobility solutions. Collaboration between public transport operators, MaaS providers, and shared mobility services was essential to address regulatory, technical, and operational challenges and to support service integration.

A key lesson learned relates to institutional involvement, as Larnaca Municipality and the Ministry of Transport, Communications and Works were not formally included as project partners. This limited their level of engagement and ability to commit dedicated responsibilities and resources to implementation activities. As a result, measures requiring regulatory or infrastructure interventions progressed more slowly or remained at the planning stage. Their formal participation could have supported more efficient decision-making, improved coordination, and enhanced the usability and long-term sustainability of the proposed measures.

Alignment with policy frameworks such as the SUMP proved important in supporting continuity and facilitating the integration of project outcomes into long-term strategies. In addition, continuous stakeholder engagement, clear communication, and transparent processes helped maintain coordination and build trust among all actors involved.

Overall, the experience demonstrated that strong governance structures, combined with institutional commitment and effective cooperation mechanisms, are essential for the successful deployment and long-term impact of integrated mobility solutions.

3.7 Conclusions

3.7.1 Krakow

The Krakow Living Lab demonstrates that demand-responsive transport services such as LajkBus can effectively complement traditional public transport systems and address mobility gaps in underserved areas.

The implementation of the service resulted in improved accessibility and a more flexible mobility offer. High user satisfaction, combined with measurable improvements in travel time and cost perception, confirms the effectiveness of the approach. The observed modal shift away from private cars further highlights the potential of such services to support sustainable mobility.

A key factor behind the success of the service was its integration with the public transport system, ensuring a seamless and user-friendly experience. The results indicate that demand-responsive transport should be further developed, particularly in areas where conventional solutions are less effective.

Overall, the Krakow case confirms that on-demand mobility services can play a crucial role in the transition towards more sustainable, inclusive, and efficient urban mobility systems, with strong potential for scaling and replication.

3.7.2 Rotterdam

The Rotterdam Living Lab demonstrates that integrating shared mobility with public transport through predictive, data-driven digital tools can add tangible value to multimodal travel, but also clearly shows the limits of technology-only solutions. In a city with a mature and trusted public transport system, shared e-mopeds remain a complementary mode rather than a mainstream alternative, particularly for older and mobility-dependent users. This context makes Rotterdam a realistic and highly relevant test case for understanding how shared mobility can be embedded responsibly within a public transport ecosystem.

The introduction of a predictive availability model in the RET travel planner confirms that reliability and predictability are crucial user needs. For travellers already open to multimodal behaviour, the availability forecast increased confidence, reduced uncertainty at transfer points, and even enhanced perceived personal safety, especially during late-night travel. These benefits underline the value of positioning shared mobility information within trusted public transport interfaces, rather than in isolated, provider-specific apps.

At the same time, the research highlights that acceptance barriers are primarily structural and perceptual, not technical. Low perceived convenience, limited time efficiency, safety concerns, and lack of first-hand experience strongly limit adoption. Digital innovations do not fundamentally change sceptical attitudes on their own. Meaningful behavioural change therefore requires a broader package of measures, including infrastructure improvements, clear regulation, better parking and safety conditions, targeted communication, and alignment with city policy objectives.

3.7.3 Coimbra

The Coimbra Living Lab demonstrated the feasibility of designing and piloting a demand-responsive transport service in a low-density peripheral area, integrated with the conventional public transport network and supported by digital and non-digital booking solutions.

The pilot generated relevant evidence regarding both the opportunities and limitations associated with the deployment of new shared mobility solutions in such contexts. Positive outcomes were observed in terms of innovation capacity, institutional learning, stakeholder cooperation, and increased awareness of demand-responsive transport concepts. The Living Lab also confirmed the relevance of combining digital tools, inclusive access channels and complementary accessibility measures to support more integrated mobility solutions.

At the same time, results indicate limited impact on actual travel behavior and service uptake. No significant modal shift was observed, while operational data confirmed low demand and challenges related to service efficiency. Survey results suggest that increased awareness did not translate into substantial use of the service, with perceived convenience, communication gaps and uncertainty regarding practical benefits emerging as key barriers to adoption.

The pilot also highlighted significant implementation constraints. External and internal factors, including roadworks, driver shortages and vehicle malfunctions, reduced service reliability and affected operational performance. These constraints limited the ability of the tested model to fully respond to user needs and operator requirements under real-world conditions.

A key conclusion is that the operating model tested through the pilot requires further revision in order to ensure a more reliable, efficient and scalable demand-responsive transport service. In particular, future development should address operational robustness, service design, integration with conventional public transport, and alignment between supply characteristics and observed demand patterns.

Findings further confirm that technological deployment alone is insufficient to ensure successful uptake of flexible mobility services. Results underline the importance of service reliability, sustained communication, user engagement and stakeholder coordination as enabling conditions for adoption. The pilot also confirmed the added value of co-creation approaches in improving relevance, identifying barriers and supporting more inclusive mobility solutions.

Although the pilot did not generate the level of behavioral change initially envisaged, it produced valuable evidence for the further development of demand-responsive mobility solutions in low-density areas. In this regard, the main contribution of the Coimbra Living Lab lies not only in the performance of the tested service, but also in the lessons generated regarding implementation conditions, barriers to uptake and requirements for future redesign.

These conclusions support the policy recommendations developed under WP5. In particular, findings point to the need for supportive policy and regulatory frameworks for demand-responsive transport, stronger institutional and operational conditions for integrated service delivery, and continued investment in inclusive digital tools, multimodal interchange solutions and accessibility improvements. Results also support the need to position demand-responsive transport as part of a broader multimodal mobility strategy, rather than as a stand-alone intervention.

Overall, the Coimbra Living Lab generated practical evidence, identified critical implementation challenges, and contributed to advancing knowledge on the deployment of innovative and inclusive mobility services in complex operational contexts. This provides a basis for refining the operating model and supporting future replication and scale-up.

3.7.4 Fredrikstad

The Fredrikstad Follower Living Lab demonstrates how shared and on-demand mobility measures can be explored, integrated, and evaluated within an existing municipal public transport system under real-world conditions. Rather than operating as a standalone or experimental pilot environment, the Living Lab was deliberately embedded in ordinary municipal service delivery and ongoing planning and governance processes. This integration increased the realism of the demonstrated measures and ensured that the lessons generated are directly relevant for day-to-day planning, operations, and decision-making in a municipal context.

By focusing on ferry-based mobility as a core element of the local transport system, the Living Lab addressed first- and last-mile challenges and intermodality in a manner connected to everyday travel behaviour. The use of waterways as part of the urban mobility network illustrates how underutilised transport corridors can complement land-based public transport and contribute to improved accessibility, particularly in cities characterised by geographical barriers such as rivers and waterfront areas. This focus also highlights the importance of recognising and working with local context when adapting shared mobility solutions originally developed in other cities.

A key strength of the Fredrikstad Living Lab lies in its evaluation approach. The combination of an established municipal travel behaviour survey framework with targeted, in situ user data enabled the Living Lab to ground its analysis in a robust contextual baseline, while also capturing demonstration-specific user experience related to transfers, usability, and perceived travel quality. This approach allowed Fredrikstad to document meaningful, implementation-relevant insights without pursuing exhaustive or resource-intensive impact measurement, which would have been disproportionate to the scale and role of a follower city.

The results underline that improvements in intermodal integration—such as transfer quality, coordination between modes, timetable alignment, and clarity of information—are decisive for user satisfaction and continued use, even where the underlying public transport service is well established. The findings indicate that small operational and organisational adjustments can have a disproportionate effect on perceived usefulness and acceptance. This reinforces the importance of focusing on the quality of interfaces between modes rather than on individual services in isolation.

The Fredrikstad experience further demonstrates that proportionate and targeted evaluation approaches can provide sufficient evidence to support learning, decision-making, and reporting within Living Labs. Rather than aiming to attribute direct causal system-wide impacts, the Living Lab documented pragmatic insights into governance arrangements, data availability, stakeholder coordination, and operational feasibility. This pragmatic approach is particularly relevant for follower cities with limited evaluation resources but access to existing municipal or regional data infrastructures.

From a governance and implementation perspective, the Living Lab highlights the importance of flexibility, expectation management, and sustained engagement over time. Several assumptions made at proposal stage did not fully align with implementation realities, reflecting the dynamic nature of municipal organisations shaped by political priorities, organisational change, and operational constraints. Transparent handling of such deviations, combined with continuous alignment between partners and clear documentation of methodological choices, proved critical to maintaining credibility, institutional trust, and progress.

Overall, the Fredrikstad Follower Living Lab illustrates how Living Labs can function as effective learning and integration arenas for shared and on-demand mobility when they are embedded in existing systems, aligned with broader governance and planning frameworks—including emerging SUMP-related work and formal street network and street use planning—and supported by proportionate data and evaluation practices. The experiences from Fredrikstad provide transferable lessons for other cities seeking to integrate new mobility solutions into established public transport systems while maintaining operational realism, institutional continuity, and pragmatic use of available data.

The insights generated through the Fredrikstad Living Lab provide relevant input for subsequent policy reflection and synthesis within the SUM project.

3.7.5 Larnaca

The Larnaca Living Lab demonstrated that an integrated approach combining digital innovation, service improvements, and supportive policy measures can effectively support the transition to sustainable urban mobility. The MaaS implementation through the PAME application enabled the integration of public transport and shared mobility services, such as journey planning, ticketing, and bikesharing, within a single platform, improving accessibility and user convenience. Complementary pull measures, including the expansion of the bike-sharing network, combined ticketing schemes, and increased bus frequency, further enhanced the attractiveness of multimodal transport.

The findings confirm that achieving modal shift requires a balanced combination of pull measures that improve service quality and push measures embedded in broader policy frameworks. In Larnaca, policy-driven actions such as parking restrictions, Park-and-Ride development, bus and bike lanes construction and measures under the city’s Sustainable Urban Mobility Plan aim to reduce congestion and encourage sustainable transport use. Ensuring strong alignment between project activities and long-term policy strategies emerged as a key recommendation for achieving lasting impact.

The Living Lab also highlighted the importance of governance and institutional support. Effective coordination among stakeholders was essential but challenged by the limited formal involvement of key authorities. Establishing clear governance structures, strengthening institutional commitment, and ensuring alignment with regulatory frameworks are therefore critical for successful implementation. In addition, sustainable business models and long-term funding mechanisms are necessary to support continued operation and scalability.

From a user perspective, behavioural change depends on service reliability, accessibility, and ease of use, supported by awareness campaigns and targeted incentives. The use of data-driven tools proved essential for monitoring performance and supporting decision-making, underlining the need for continuous data collection and evaluation.

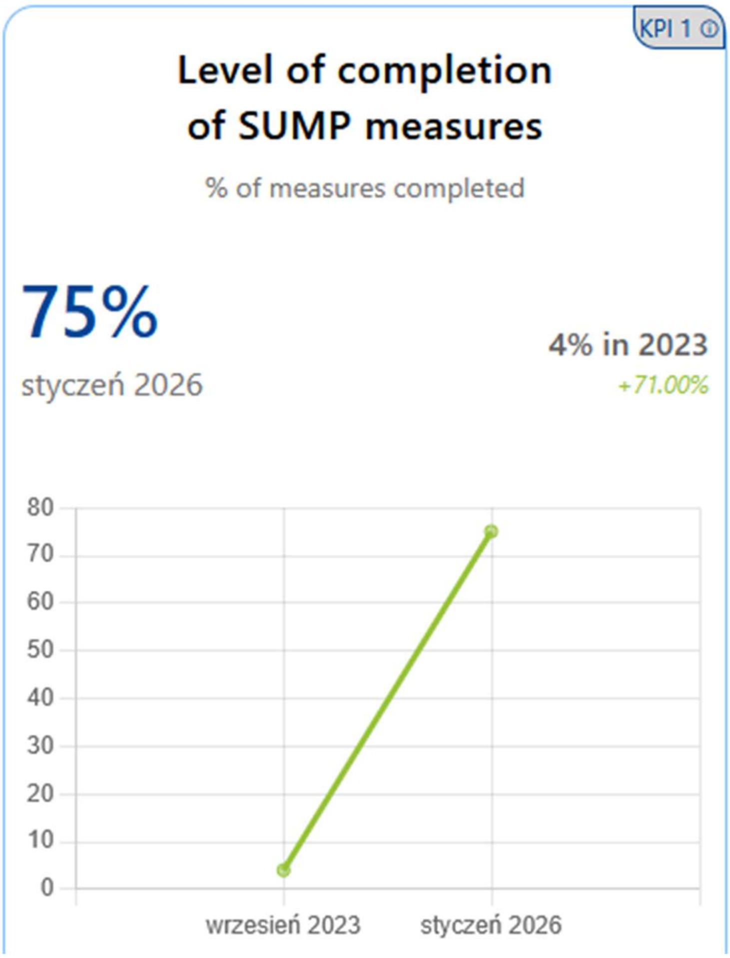
Overall, the experience demonstrates that coordinated technological, operational, and policy interventions, supported by strong governance and continuous improvement, can deliver meaningful progress towards integrated and sustainable urban mobility systems, providing transferable insights for similar urban contexts.

4 Annexes

4.1.1 Krakow

4.1.1.1 KPI's results

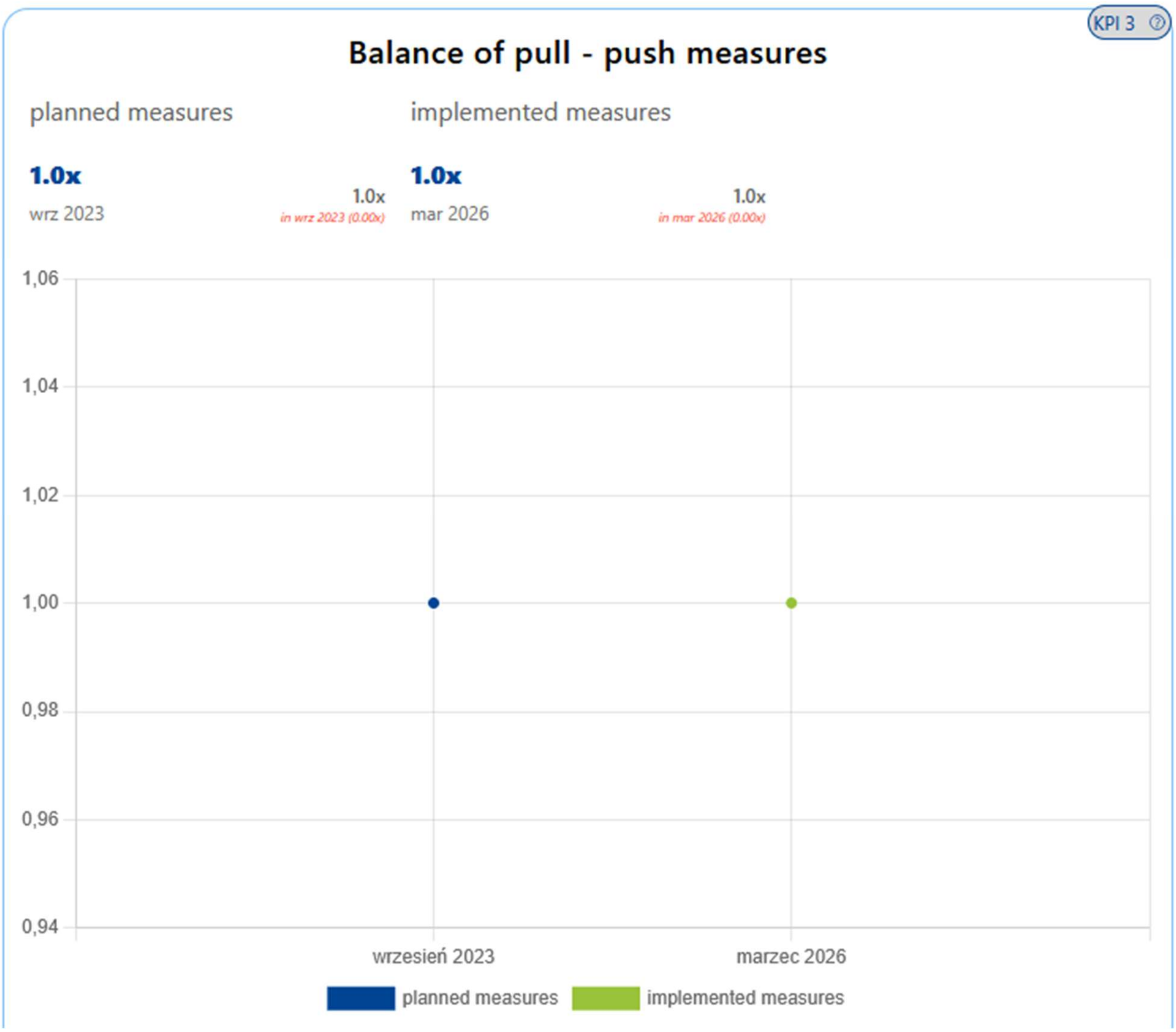
KPI 1



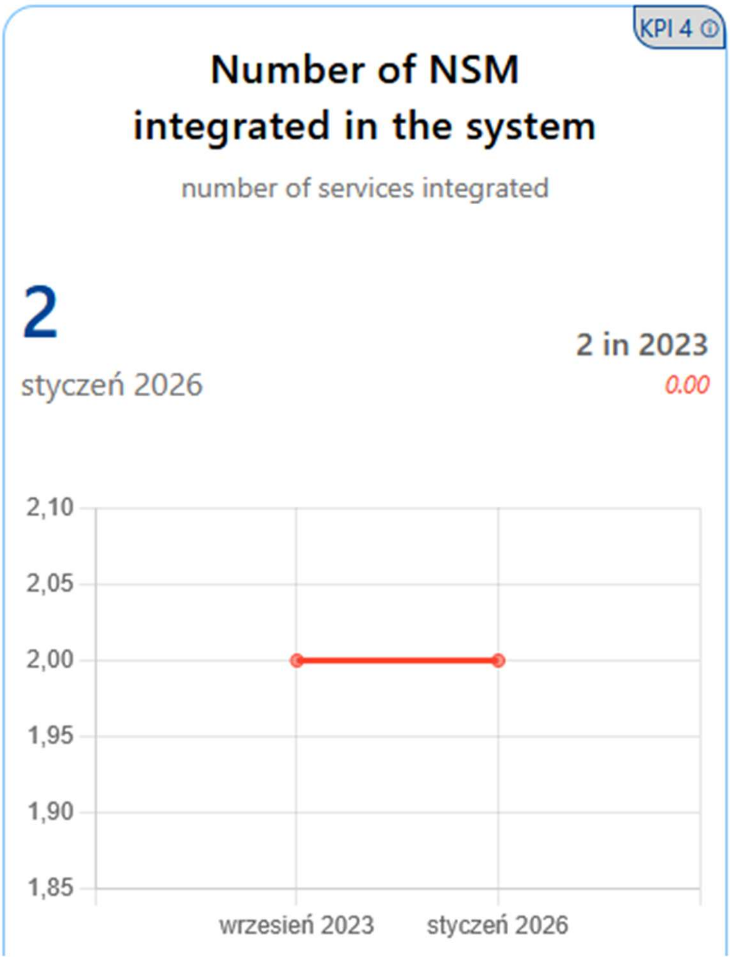
KPI 2


KPI 2
Community Involvement
number of activities organized
4
styczeń 2026
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0
wrzesień 2023
styczeń 2026

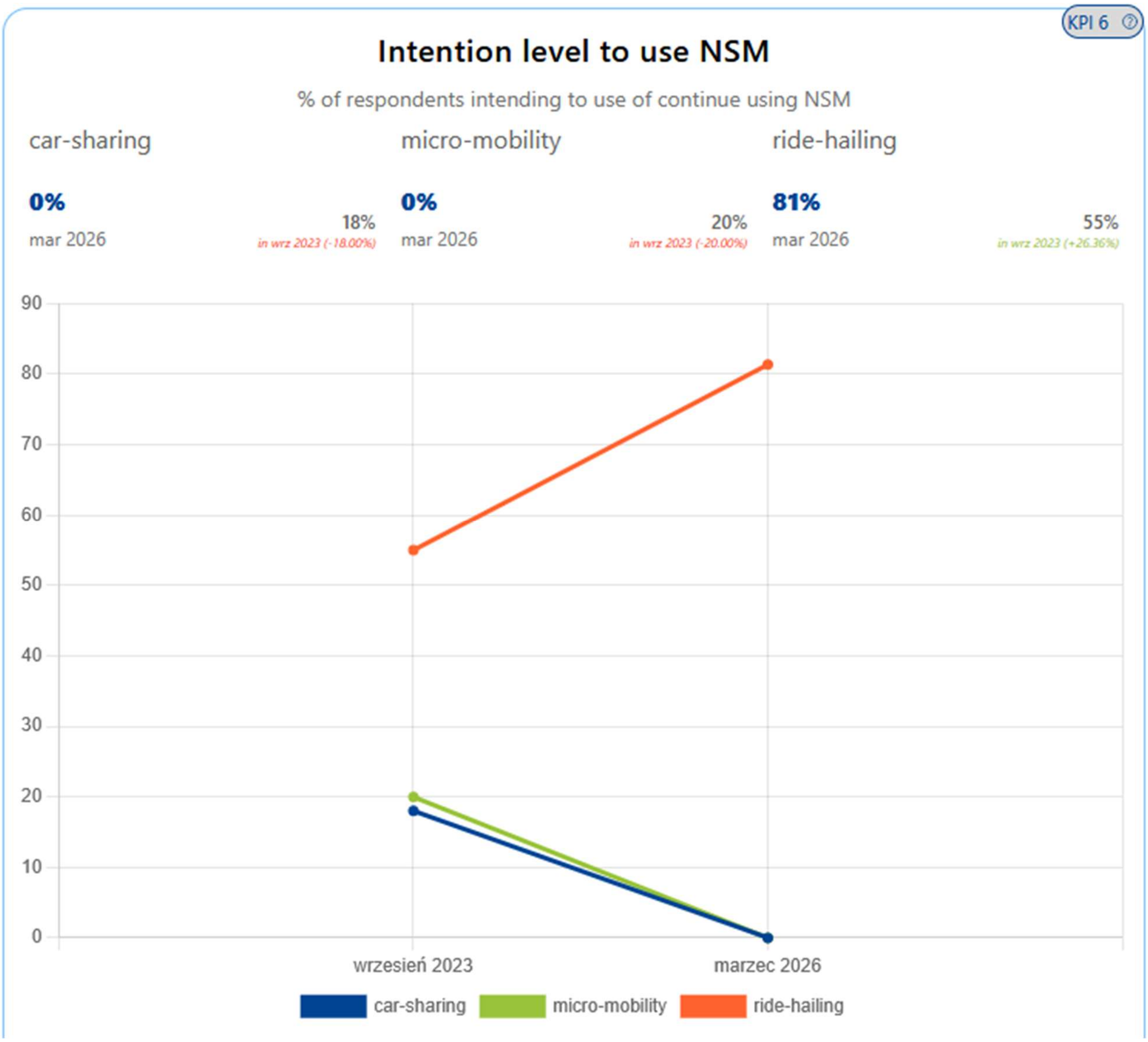
KPI 3


KPI 3
Balance of pull - push measures
planned measures
implemented measures
1.0x
wrz 2023
1.0x
in wrz 2023 (0.00x)
1.0x
mar 2026
1.0x
in mar 2026 (0.00x)
1,06
1,04
1,02
1,00
0,98
0,96
0,94
wrzesień 2023
marzec 2026
planned measures
implemented measures

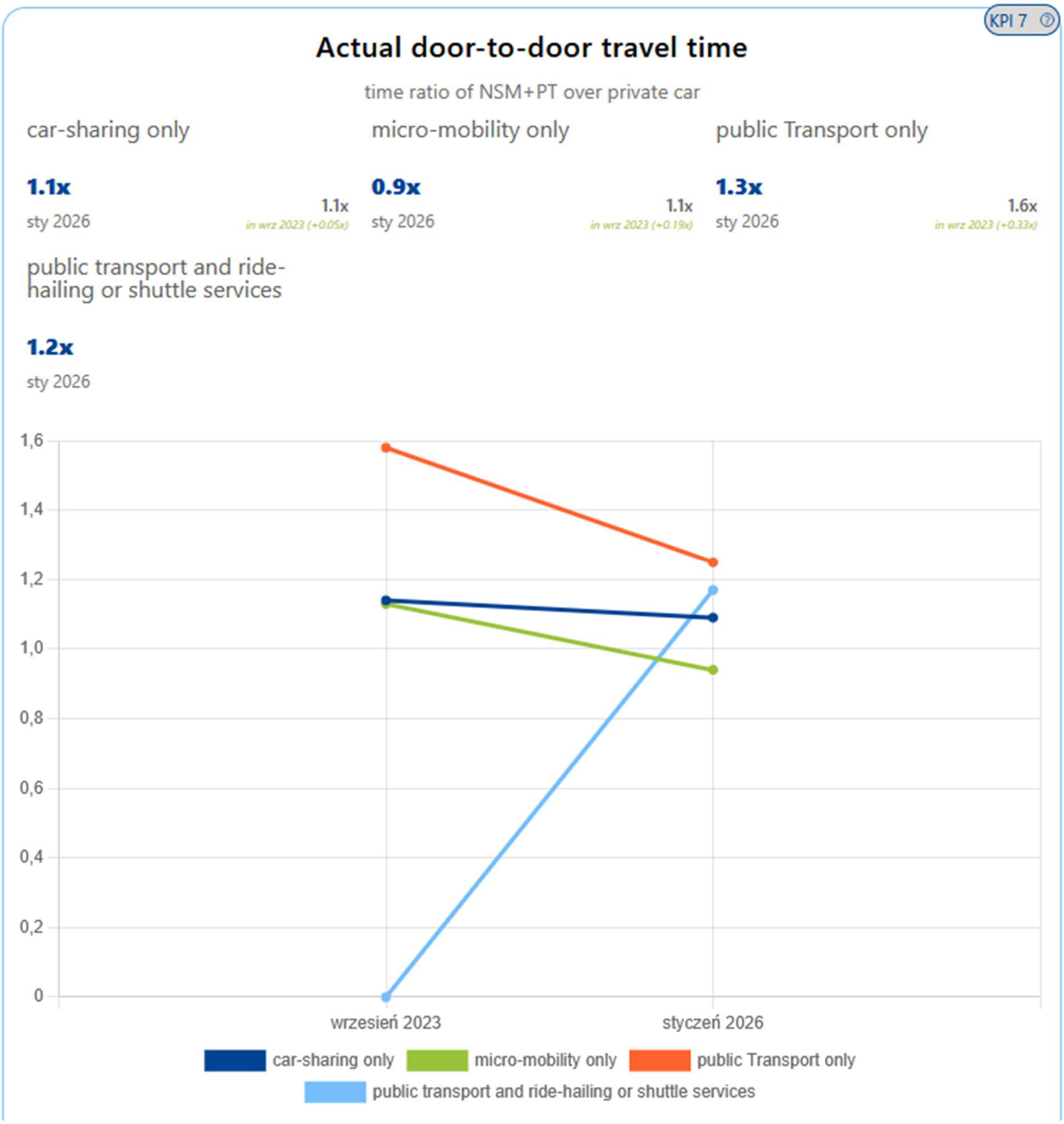
KPI 4


KPI 4
Number of NSM integrated in the system
number of services integrated
2
styczeń 2026
2 in 2023
0.00
2,10
2,05
2,00
1,95
1,90
1,85
wrzesień 2023
styczeń 2026

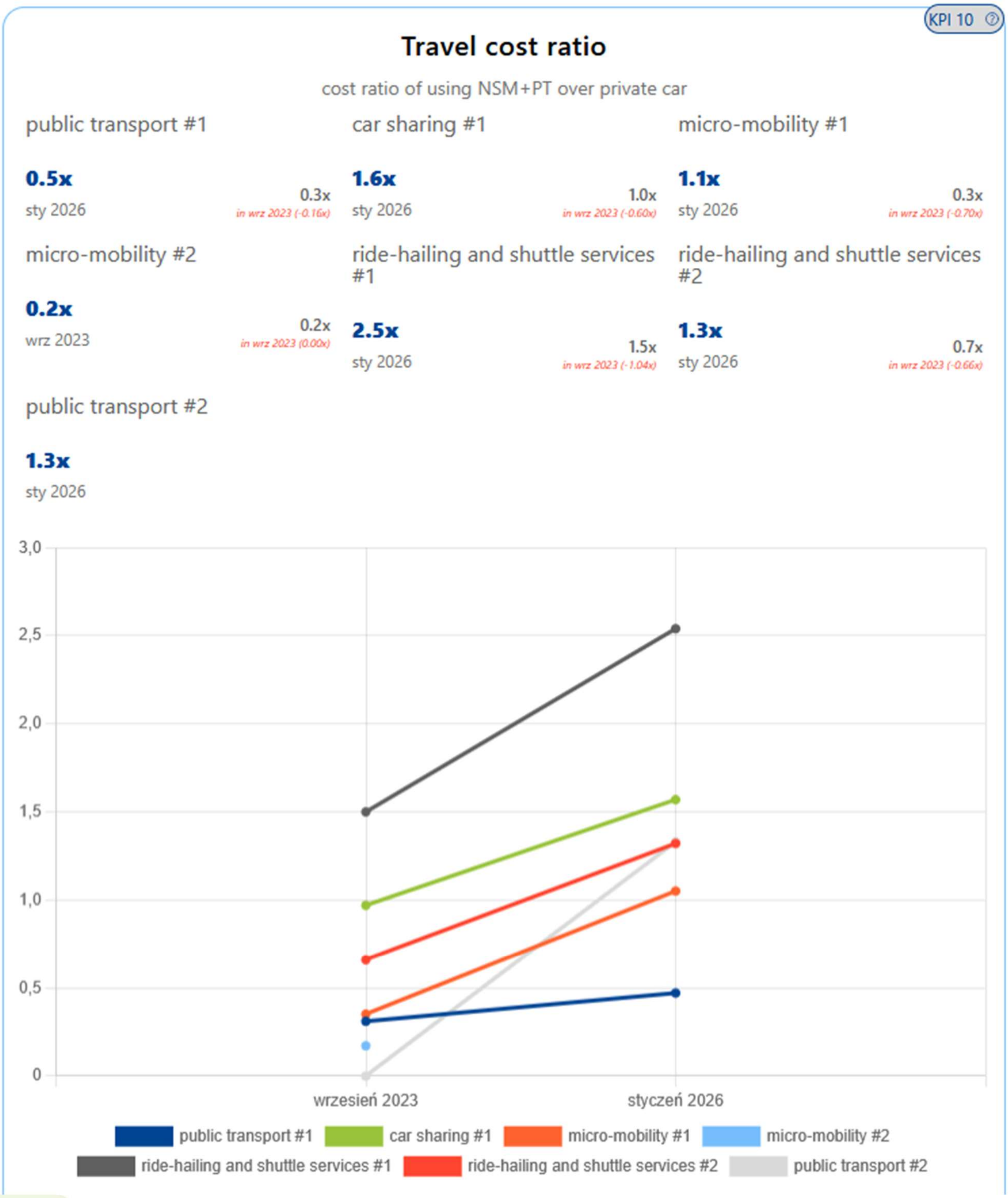
KPI 6


KPI 6
Intention level to use NSM
% of respondents intending to use of continue using NSM
car-sharing
0%
mar 2026
18%
in wrz 2023 (-18.00%)
micro-mobility
0%
mar 2026
20%
in wrz 2023 (-20.00%)
ride-hailing
81%
mar 2026
55%
in wrz 2023 (+26.36%)
90
80
70
60
50
40
30
20
10
0
wrzesień 2023
marzec 2026
car-sharing
micro-mobility
ride-hailing

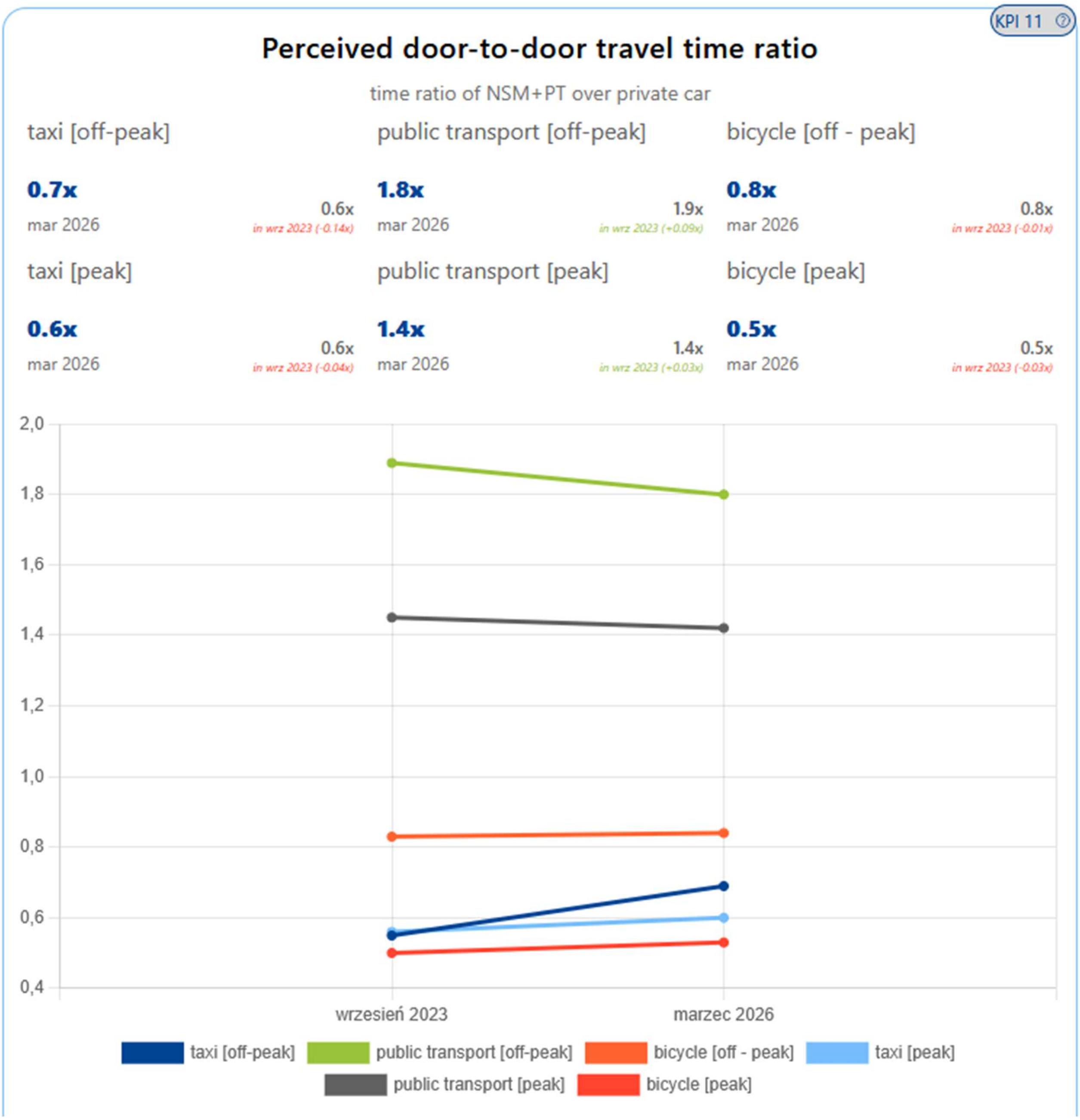
KPI 7


KPI 7
Actual door-to-door travel time
time ratio of NSM+PT over private car
car-sharing only
1.1x
sty 2026
1.1x
in wrz 2023 (+0.05x)
micro-mobility only
0.9x
sty 2026
1.1x
in wrz 2023 (+0.19x)
public Transport only
1.3x
sty 2026
1.6x
in wrz 2023 (+0.33x)
public transport and ride-hailing or shuttle services
1.2x
sty 2026
1,6
1,4
1,2
1,0
0,8
0,6
0,4
0,2
0
wrzesień 2023
styczeń 2026
car-sharing only
micro-mobility only
public Transport only
public transport and ride-hailing or shuttle services

KPI 10


KPI 10
Travel cost ratio
cost ratio of using NSM+PT over private car
public transport #1
0.5x
sty 2026
0.3x
in wrz 2023 (-0.16x)
car sharing #1
1.6x
sty 2026
1.0x
in wrz 2023 (-0.60x)
micro-mobility #1
1.1x
sty 2026
0.3x
in wrz 2023 (-0.70x)
micro-mobility #2
0.2x
wrz 2023
0.2x
in wrz 2023 (0.00x)
ride-hailing and shuttle services #1
2.5x
sty 2026
1.5x
in wrz 2023 (-1.04x)
ride-hailing and shuttle services #2
1.3x
sty 2026
0.7x
in wrz 2023 (-0.66x)
public transport #2
1.3x
sty 2026
3,0
2,5
2,0
1,5
1,0
0,5
0
wrzesień 2023
styczeń 2026
public transport #1
car sharing #1
micro-mobility #1
micro-mobility #2
ride-hailing and shuttle services #1
ride-hailing and shuttle services #2
public transport #2

KPI 11

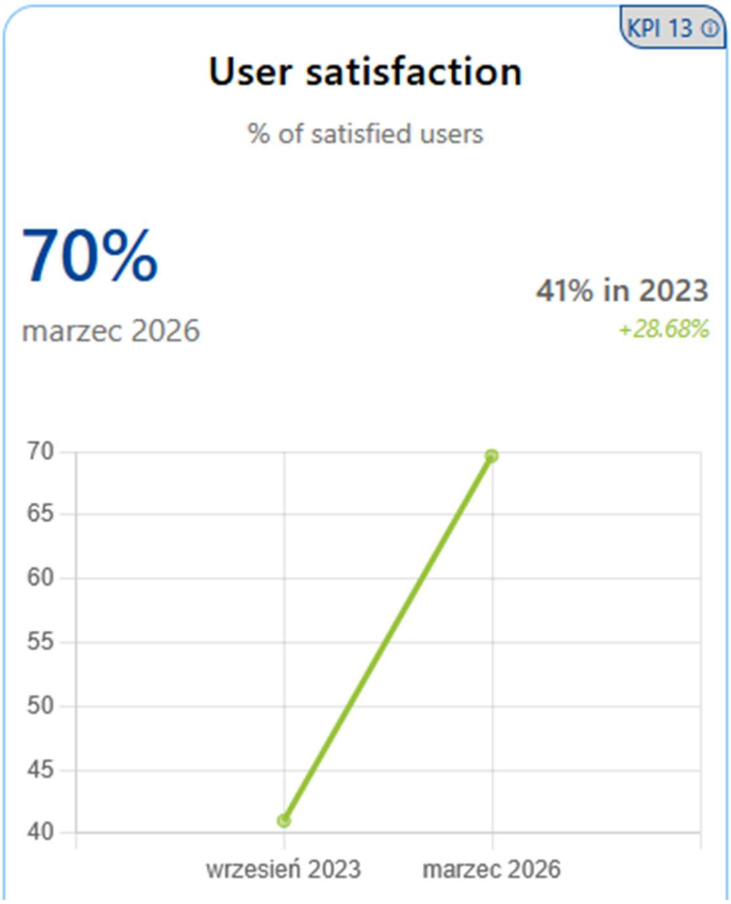


KPI 11
Perceived door-to-door travel time ratio
time ratio of NSM+PT over private car
taxi [off-peak]
0.7x
mar 2026
0.6x
in wrz 2023 (-0.14x)
public transport [off-peak]
1.8x
mar 2026
1.9x
in wrz 2023 (+0.09x)
bicycle [off - peak]
0.8x
mar 2026
0.8x
in wrz 2023 (-0.01x)
taxi [peak]
0.6x
mar 2026
0.6x
in wrz 2023 (-0.04x)
public transport [peak]
1.4x
mar 2026
1.4x
in wrz 2023 (+0.03x)
bicycle [peak]
0.5x
mar 2026
0.5x
in wrz 2023 (-0.03x)
2,0
1,8
1,6
1,4
1,2
1,0
0,8
0,6
0,4
wrzesień 2023
marzec 2026
taxi [off-peak]
public transport [off-peak]
bicycle [off - peak]
taxi [peak]
public transport [peak]
bicycle [peak]

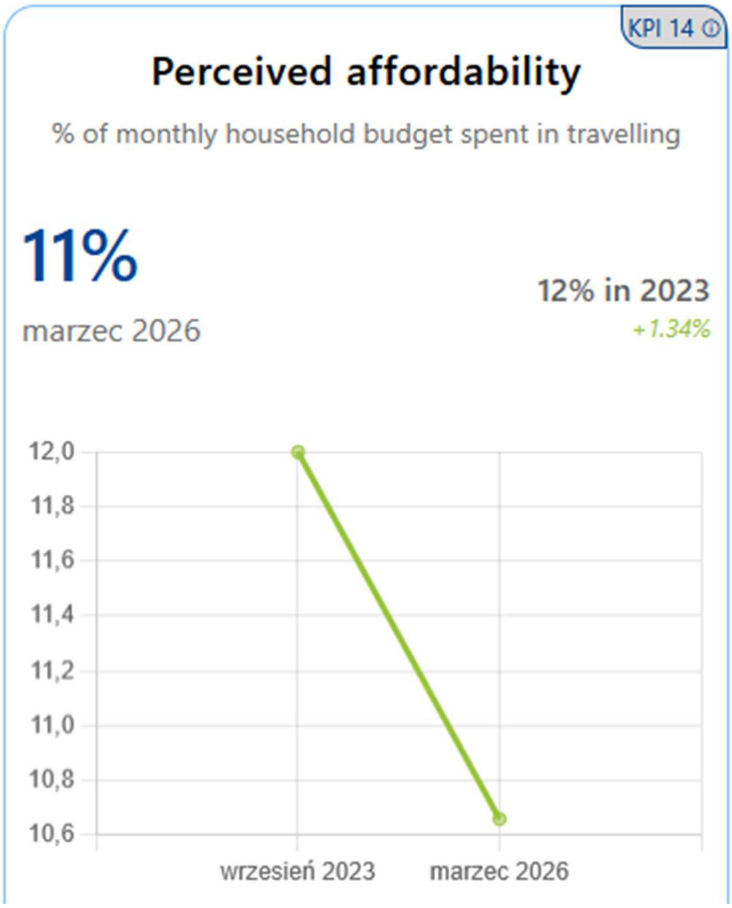
KPI 12


KPI 12
Perceived safety diff
safety levels (from -5 to 5)
personal safety diff - taxi
-1.46078
mar 2026
-1.53
in wrz 2023 (+0.07)
personal safety diff - public transport
-1.210784
mar 2026
-1.77
in wrz 2023 (+0.56)
personal safety diff - bicycle
-0.7254902
mar 2026
-0.99
in wrz 2023 (+0.26)
traffic safety diff - taxi
-0.2941177
mar 2026
-0.27
in wrz 2023 (-0.02)
safety diff - public transport
0.7352941
mar 2026
0.41
in wrz 2023 (+0.33)
safety diff - bicycle
-0.509804
mar 2026
-0.87
in wrz 2023 (+0.36)
1,0
0,5
0
-0,5
-1,0
-1,5
-2,0
wrzesień 2023
marzec 2026
personal safety diff - taxi
personal safety diff - public transport
personal safety diff - bicycle
traffic safety diff - taxi
safety diff - public transport
safety diff - bicycle

KPI 13


KPI 13
User satisfaction
% of satisfied users
70%
marzec 2026
41% in 2023
+28.68%
70
65
60
55
50
45
40
wrzesień 2023
marzec 2026

KPI 14


KPI 14
Perceived affordability
% of monthly household budget spent in travelling
11%
marzec 2026
12% in 2023
+1.34%
12,0
11,8
11,6
11,4
11,2
11,0
10,8
10,6
wrzesień 2023
marzec 2026

KPI 16

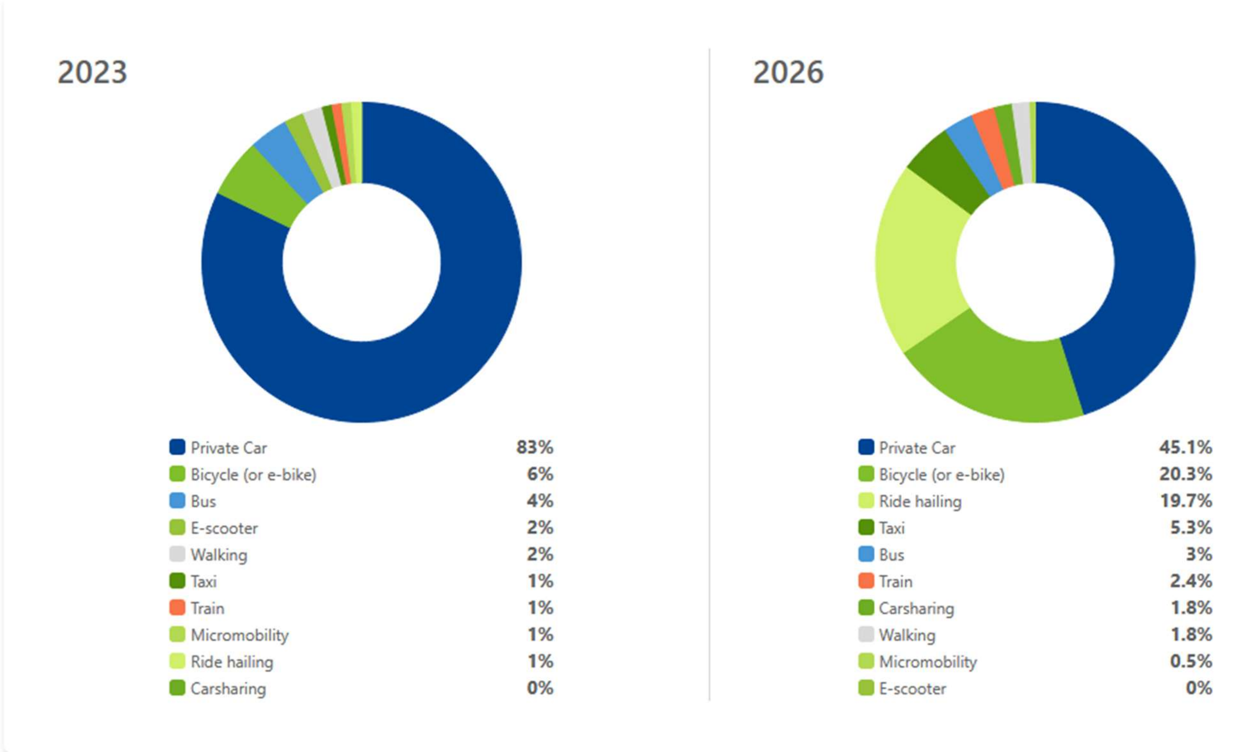

KPI 16
Greenhouse emissions
tons/y/cap
0.2440508
marzec 2026
0.3477136 in 2023
+0.10
0,36
0,34
0,32
0,30
0,28
0,26
0,24
wrzesień 2023
marzec 2026

KPI 24

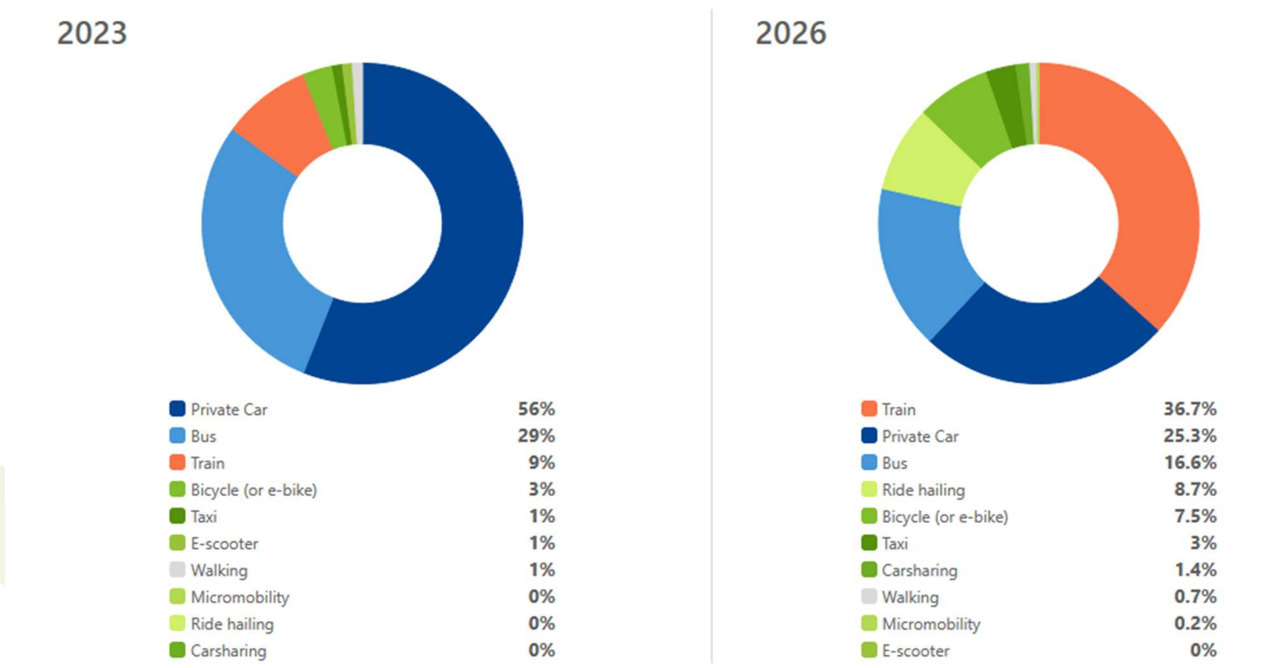

KPI 24
Congestion and travel delays
travel time ratio
1.7x
marzec 2026
2.1x in 2023
+0.42x
2,15
2,10
2,05
2,00
1,95
1,90
1,85
1,80
1,75
1,70
wrzesień 2023
marzec 2026

MODAL SPLIT

Modal Split in vehicle kilometers

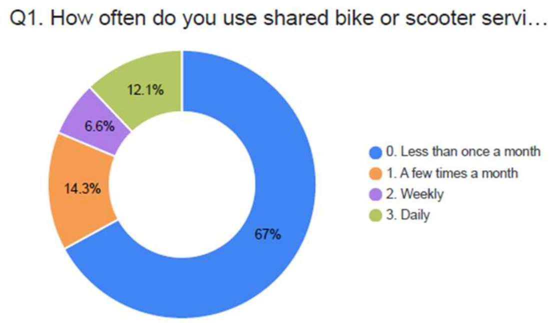


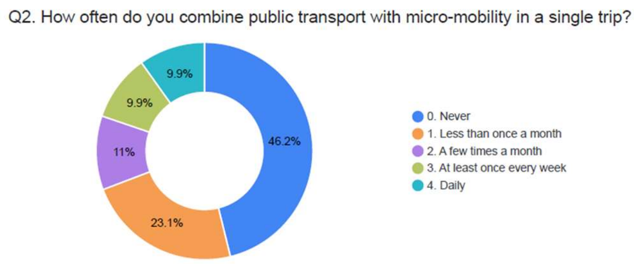
Modal Split in passenger kilometers



4.1.2 Rotterdam

4.1.2.1 Annex 1: SUM WP4 – Customer Survey – Results





Q3

In general, when you open the app of a shared micro-mobility service (like CHECK or Donkey Republic) or the RET app, how often is at least one vehicle available near the location you are searching for?

Scale from 1 (Almost never available) to 7 (Almost always available)

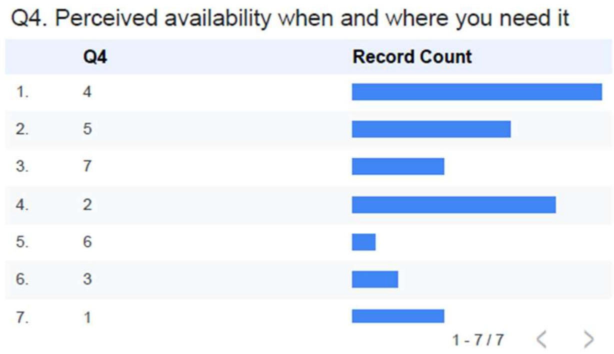
(Don't know: 58)

Q4

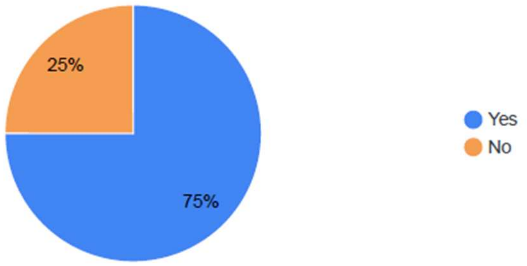
When planning to use shared e-scooters or bikes with public transit, do you feel confident that they will be available near transit stops when you need them?

Scale from 1 (Not confident at all) to 7 (Very confident)

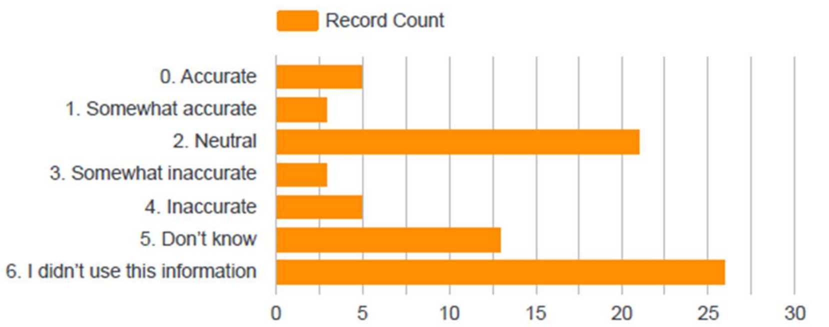
(Don't know: 53)



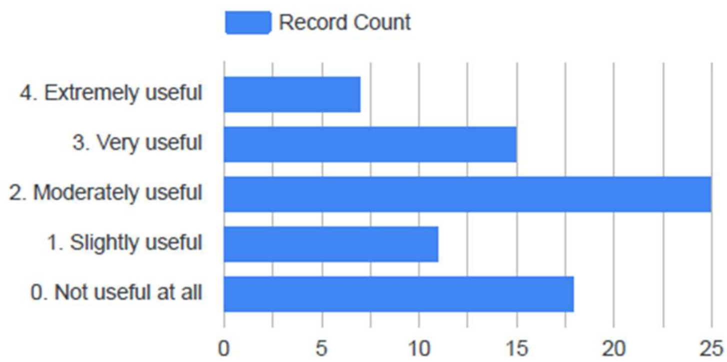
Q5. Have you noticed the new fleet availability information in the RET app before?



Q6. How accurate do you find the predicted fleet availability information?

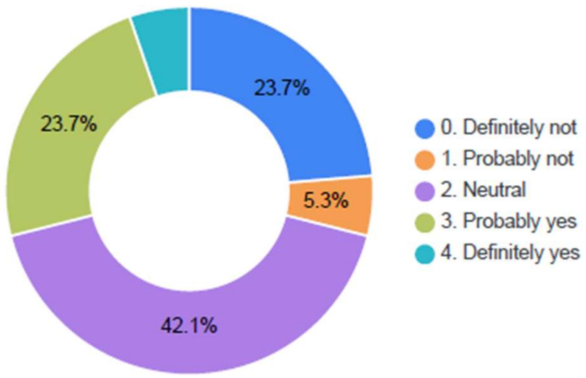


Q7. How useful do you find the predicted fleet availability in the RET app?



Q8.

Would you prefer to use CHECK over other shared e-scooter services because of its new fleet availability prediction function on RET app?



Key insights:

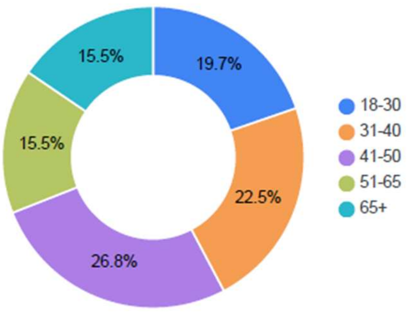
1. Users appreciate having access to shared e-scooter information, but would prefer it to be optional or customizable within the app.

2. Some users value a cleaner app interface focused on their primary travel mode and suggest minimizing non-essential information. Clearer communication and better integration could improve usability for those unfamiliar with the feature.

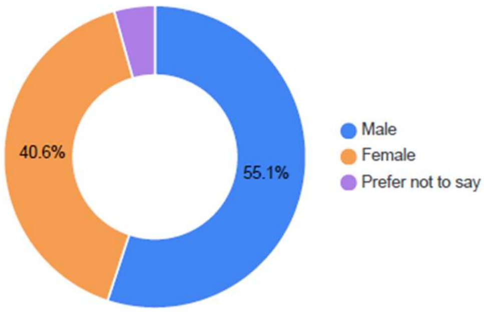
3. A few users emphasize the importance of maintaining RET's core public transport offerings alongside new mobility options.

4. Appreciation from travel-safe perspective: "**Very nice, especially when it is late at night, in the dark, as a woman alone. I feel much more reassured when I know I can quickly and guaranteed to get a CHECK!**"

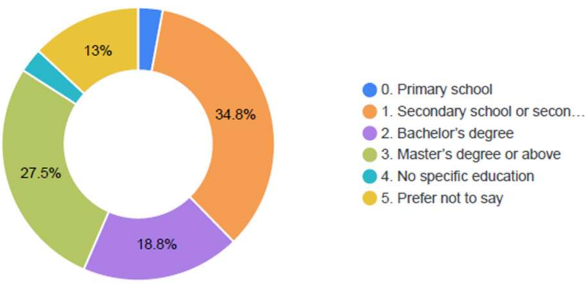
Q10. Age distribution



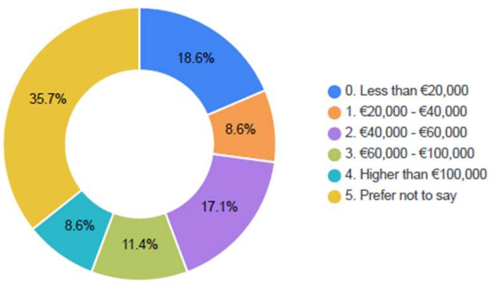
Q11. Gender distribution



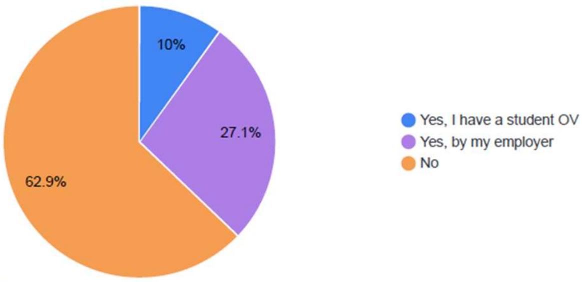
Q12. Education level distribution



Q13. Annual income lever distribution

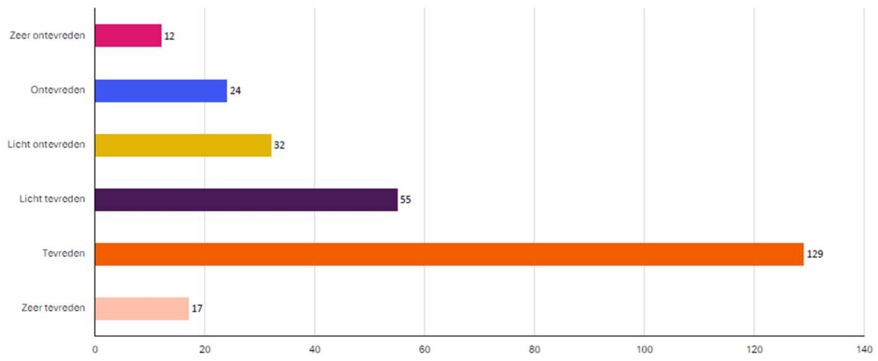


Q14. Are your public transport trips funded by your employer or by student OV?

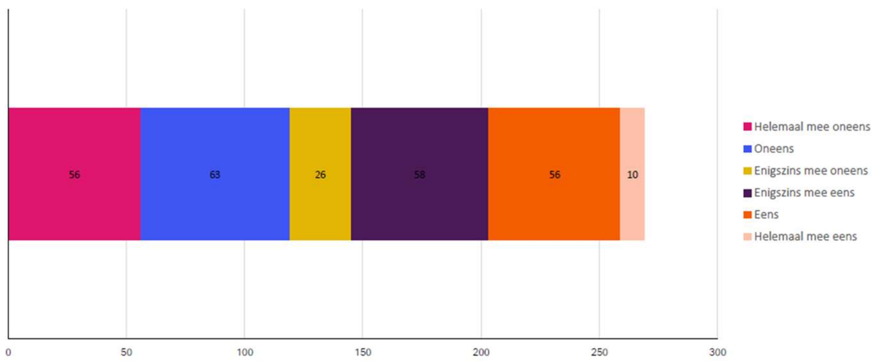


4.1.2.2 Annex 2: Acceptance Survey – questions/results

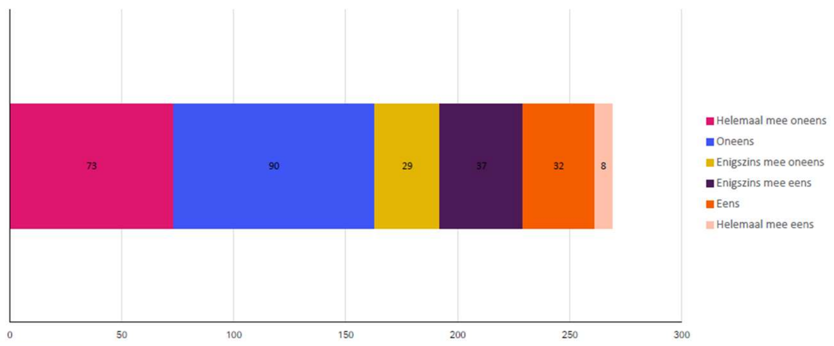
2 - Hoe tevreden ben je over het vervoerssysteem (ov + deelmobiliteit) in Rotterdam?



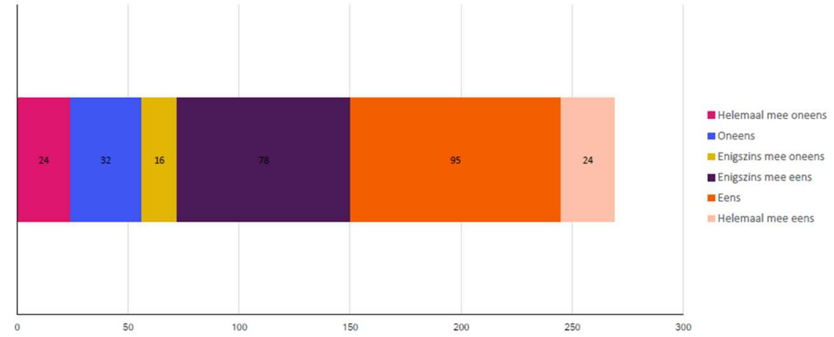
3.1 - De mensen om mij heen vinden dat ik het vervoerssysteem moet gebruiken.



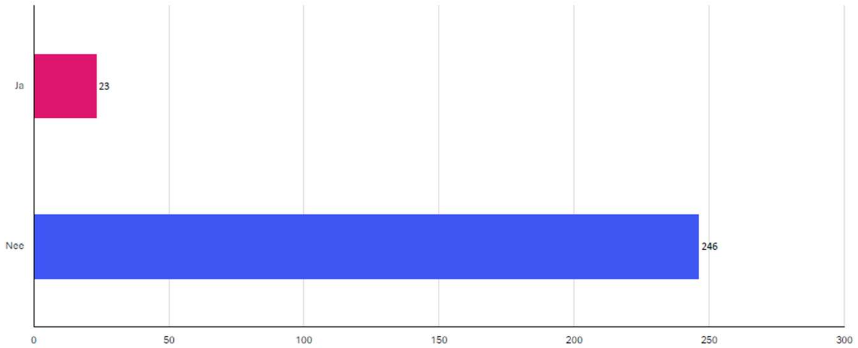
3.2 - Ik ben eerder geneigd het vervoerssysteem te gebruiken als de mensen om mij heen dat ook doen.



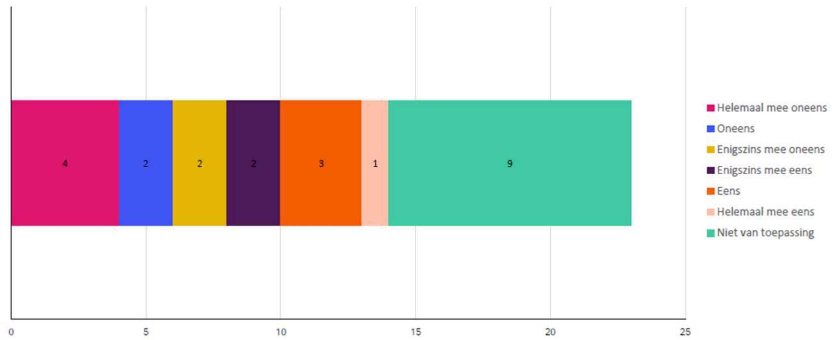
3.3 - Wanneer ik gebruikmaak van het vervoerssysteem, kan ik makkelijk overstappen van het ene vervoermiddel op het andere.



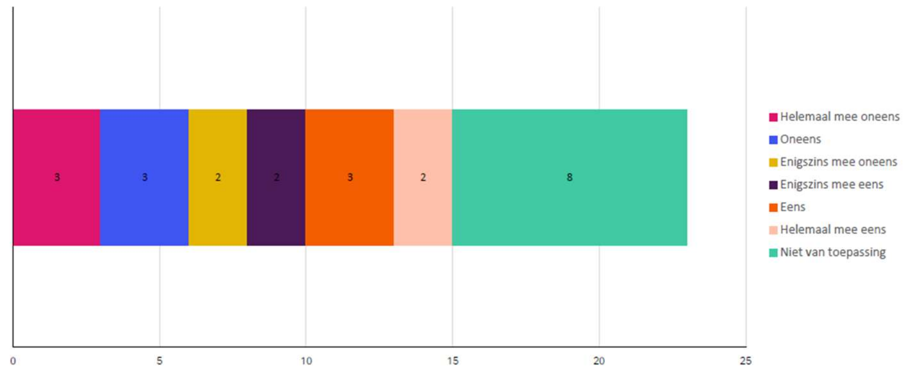
4 - Heb je wel eens een deelscooter gebruikt?



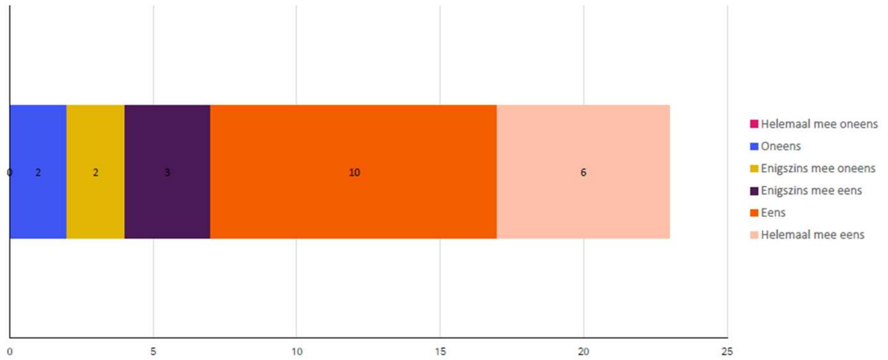
5.1 - Ik vind het gebruik van deelscooters in mijn dagelijkse woon-werkverkeer handig.



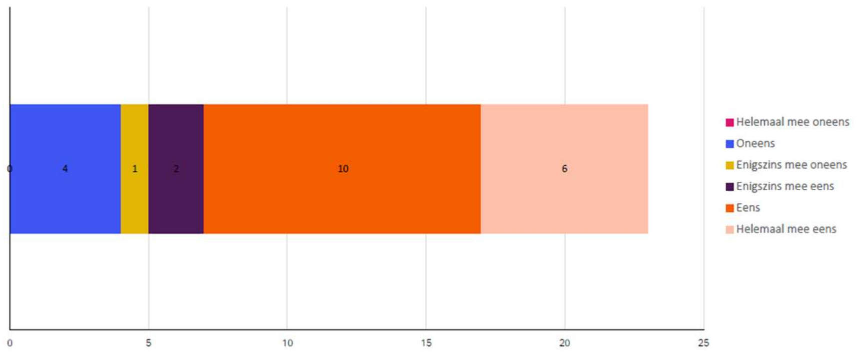
5.2 - Ik denk dat het gebruik van deelscooters mij tijdwinst oplevert in mijn dagelijkse woon-werkverkeer.



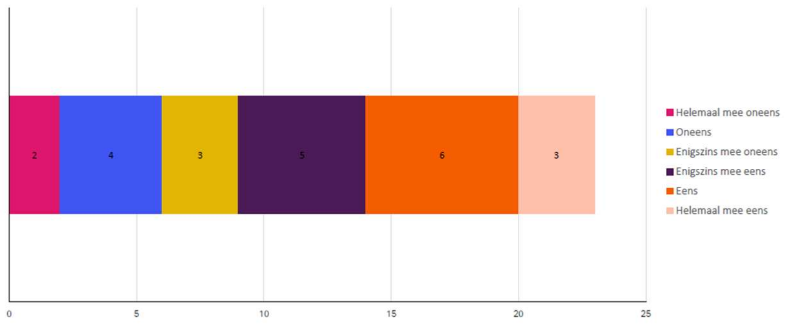
6.1 - Ik vind het gemakkelijk om te begrijpen hoe je deelscooters gebruikt.



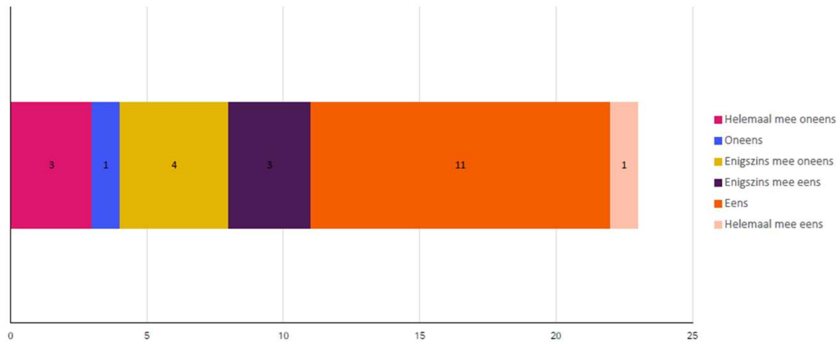
6.2 - Het kostte mij weinig tijd om te leren hoe je deelscooters gebruikt.



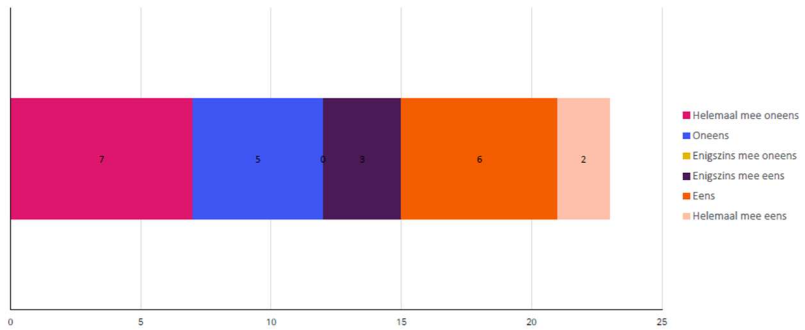
6.3 - Ik heb gemakkelijk toegang tot deelscooters.



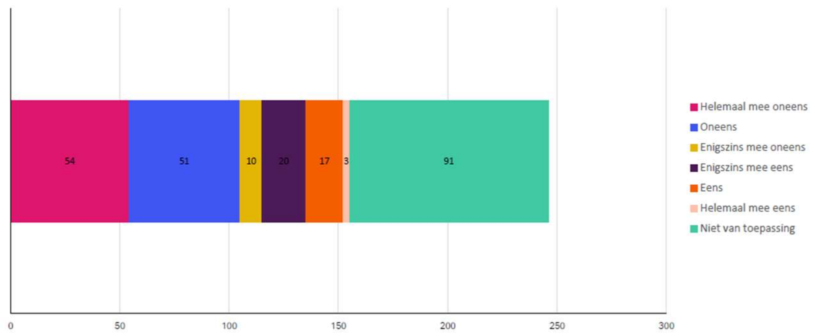
6.4 - Ik kan deelscooters veilig gebruiken.



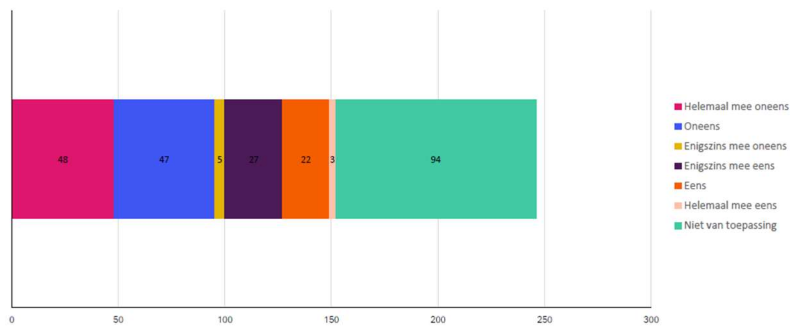
6.5 - Ik ben van plan om deelscooters te blijven gebruiken.



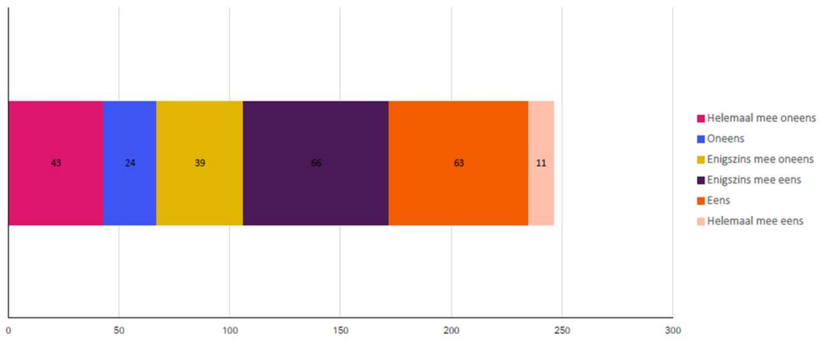
7.1 - Ik denk dat het gebruik van deelscooters in mijn dagelijkse woon-werkverkeer handig zou zijn.



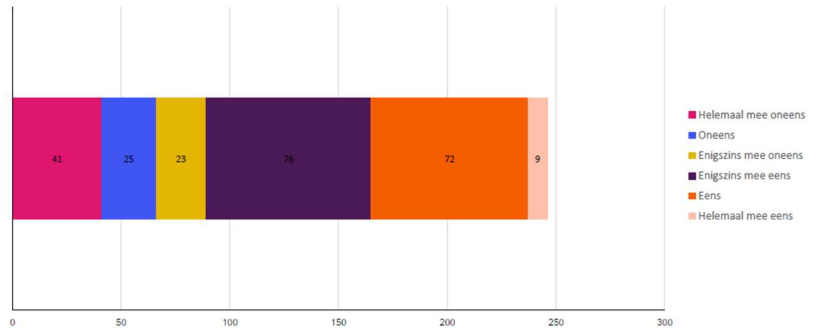
7.2 - Ik denk dat het gebruik van deelscooters mij tijdwinst oplevert in mijn dagelijkse woon-werkverkeer.



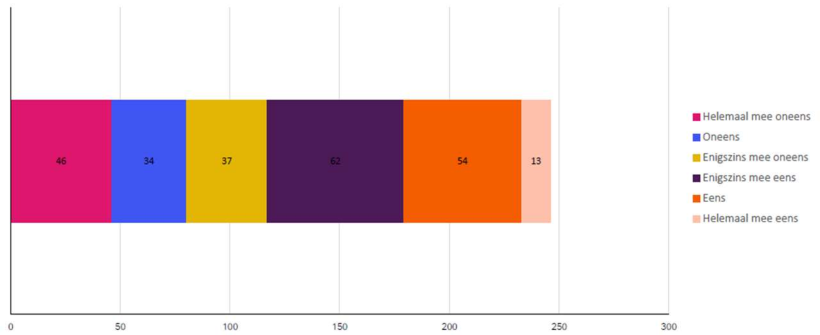
8.1 - Ik denk dat het makkelijk te begrijpen is hoe je deelscooters gebruikt.



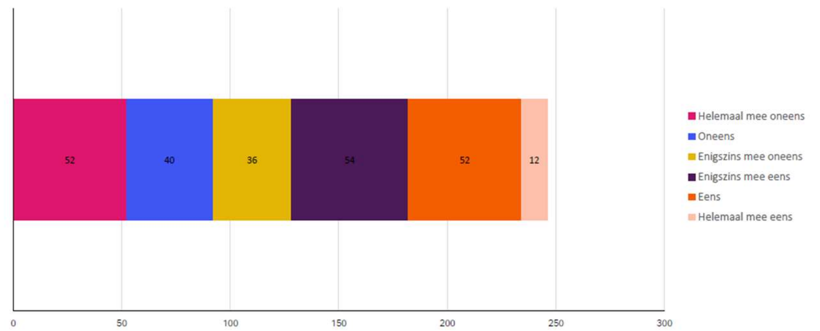
8.2 - Ik denk dat het niet lang zou duren om te leren hoe je deelscooters gebruikt.



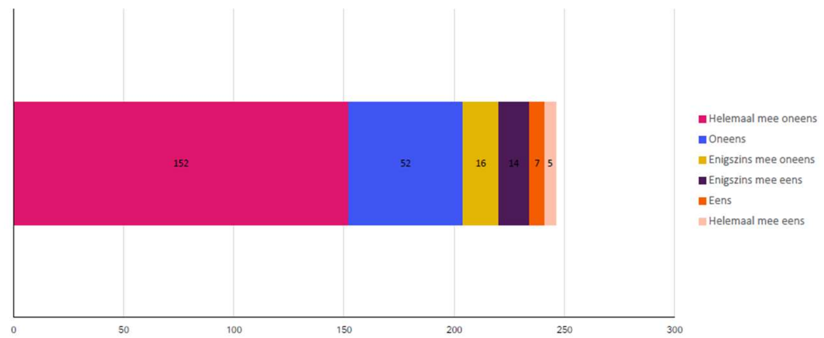
8.3 - Ik zou gemakkelijk toegang kunnen krijgen tot deelscooters.



8.4 - Ik zou deelscooters veilig kunnen gebruiken.



8.5 - Ik ben van plan om deelscooters te gebruiken.



4.1.2.3 Annex 3: Scientific results WP1 Acceptance Survey

In Rotterdam, a total of 269 responses was gathered (given that some questions were made optional by the LL, some variables have less than 269 data). The population is composed of 108 females (40.3%), 158 males (59%) and 2 respondents who preferred not to state their gender (0.8%). The average age of the population is of 62.6 years old (between 15 and 97 years old, SD=15.0).

The preparation of data for analysis showed a great consistency between the two items assessing effort expectancy (Cronbach's alpha=.89), therefore allowing us to treat them as one variable.

23 respondents (8.6%) already used e-mopeds, while the vast majority, 246 respondents (91.4%) never used it. Descriptive statistics showed average scores regarding effort expectancy, perceived accessibility, and perceived safety. However, the means scores of perceived conveniency and time-efficiency were low, which could show a negative perception of the service regarding those aspects. Overall, respondents seem to have a very low intention to use e-mopeds.

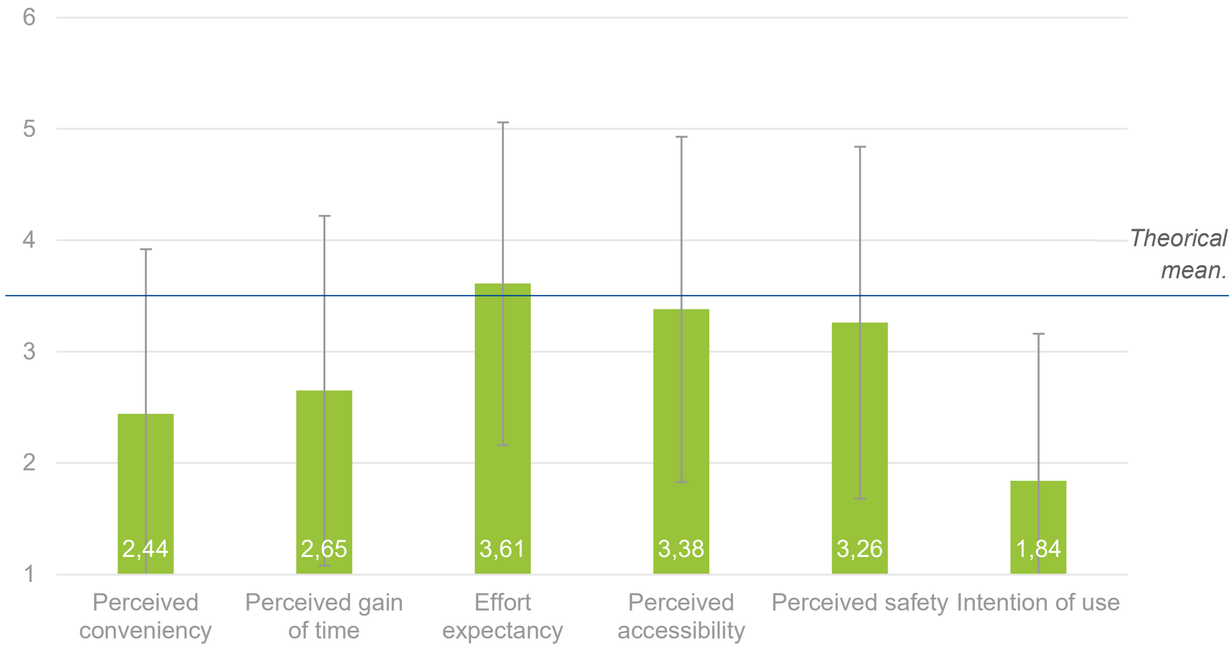


Figure 43 Descriptive statistics of e-mopeds acceptance (Rotterdam)

All the acceptance variables are impacting the intention to use e-mopeds (see figure 4):

- The more respondents perceived the service as convenient, the more they intended to use e-mopeds (r=.66; p<.001).
- The more respondents perceived they could gain time by using e-mopeds, the more they intended to use it (r=.58; p<.001).
- The more respondents perceived the service as safe, the more they intended to use it (r=.54; p<.001).
- The more respondents perceived the service as easy to use, the more they intended to use it (r=.46; p<.001).
- Finally, the more respondents perceived the service as accessible, the more they intended to use (r=.46; p<.001)

4.1.3 Coimbra

No separate annexes are included in the Coimbra contribution. The detailed survey questionnaires are documented within the relevant Work Package deliverables. Additional results and support materials can be provided if required.

4.1.4 Fredrikstad

No separate annexes are included in the Fredrikstad contribution. Detailed KPI tables, survey questionnaires, operational documentation, and supplementary material referred to in the text are part of existing municipal and project documentation and can be made available upon request if required for the compilation of the WP4 master deliverable.

4.1.5 Larnaca

Synthetic OD Allocation Methodology Round 1 of the Larnaca resident survey (n=202) collected geographic origin-destination data at zone level (35 zones), while Round 2 (n=232) used activity-based OD categories (Home, Work, Shopping, etc.). To enable spatial comparison and transport modelling across both rounds, a hybrid imputation was used.

Methodology Overview

The approach combines four sequential phases:

Phase 1 — Hot-Deck Matching (Origin Assignment). Each R2 respondent is matched to the k=5 nearest R1 donors using Gower distance over five shared variables: off-peak car travel time (weight=2.0), occupation (1.5), age band (1.0), transport mode (1.0), and gender (0.5). Travel time serves as the primary spatial signal — respondents reporting longer commutes are matched to more distant zones. The residence zone is assigned via inverse-distance weighted random draw from the top-5 donors.

Phase 2 — Gravity Model (Destination Assignment). Destination choice is modelled using a gravity formulation calibrated on R1's observed OD flows: $P(j|i) \propto D_j \cdot d_{ij}^{(-\beta)}$, where D_j is zone attractiveness (from R1 trip activity) and d_{ij} is haversine distance. The impedance exponent $\beta=0.50$ was estimated via log-linear regression on R1 flows. Purpose-specific modifiers adjust both impedance sensitivity and destination attractors (e.g., work trips receive boosted weights toward employment zones like Skala and Livadia).

Phase 3 — IPF Reconciliation. Iterative Proportional Fitting constrains the synthetic OD matrix to match R1's origin and destination marginal distributions, scaled to R2's trip volume. The algorithm converged in 19 iterations (max error < 0.01). Destinations are then re-sampled using a 50/50 blend of IPF-adjusted and gravity-model probabilities to preserve both aggregate consistency and trip-level plausibility.

Phase 4 — Validation. Monte Carlo stability analysis (10 replications) confirms that origin zone shares are robust (±1.3% standard deviation). Gower match distances indicate 90.5% high-confidence matches (≤0.3). Trip distance statistics (mean 4.4 km, median 2.7 km) are consistent with Larnaca's compact urban form.

Validation Diagnostics

Table 14 Synthetic OD allocation validation diagnostics

Diagnostic	Result
Total trips allocated	**478**
Zones covered	**35**
Unique OD pairs	**146**
Intra-zonal trips	**210 (43.9%)**
Mean trip distance	**4.4 km**
Median trip distance	**2.7 km**
95th percentile distance	**14.8 km**
High confidence matches (Gower ≤ 0.3)	**210 / 232 (90.5%)**
Calibrated impedance exponent (β)	**0.50**
IPF convergence	**19 iterations (err < 0.01)**
Monte Carlo origin stability (±SD)	**± 0.7–1.3%**
Top destination (Skala share)	**32.2%**

The chi-squared divergence from R1 origin distribution (χ^2=154.8, df=34) is expected and reflects R2's genuinely different demographic composition (37% PT users vs 6% in R1, younger age profile). The model correctly captures these differences rather than forcing R1's spatial pattern onto R2.

The full implementation script (Python) and output dataset (CSV with 491 rows, 14 columns per respondent-trip) are available as supplementary digital files.

4.1.6 Investigation of Modal Shifts

4.1.6.1 Main datasets

The analysis presented in this report is based on two survey waves conducted within the framework of the SUM project: an ex-ante survey carried out prior to the implementation of the push/pull measures, and an ex-post survey conducted following their deployment. In this deliverable, a short version of a general report is provided. **This deliverable presents a condensed version of the general report. The complete report is included in the final section of Deliverable D4.2.**

The data collection process across nine different cities and eight different languages constituted a particularly challenging task from the beginning of the project. National Technical University of Athens (NTUA) and University of Twente (UT) were responsible for the development of the original survey questionnaire in English, as well as for the overall data analysis framework. However, each Living Lab (LL) was responsible for translating the questionnaire into the local language, integrating it into the preferred survey platform, and distributing it through effective communication channels.

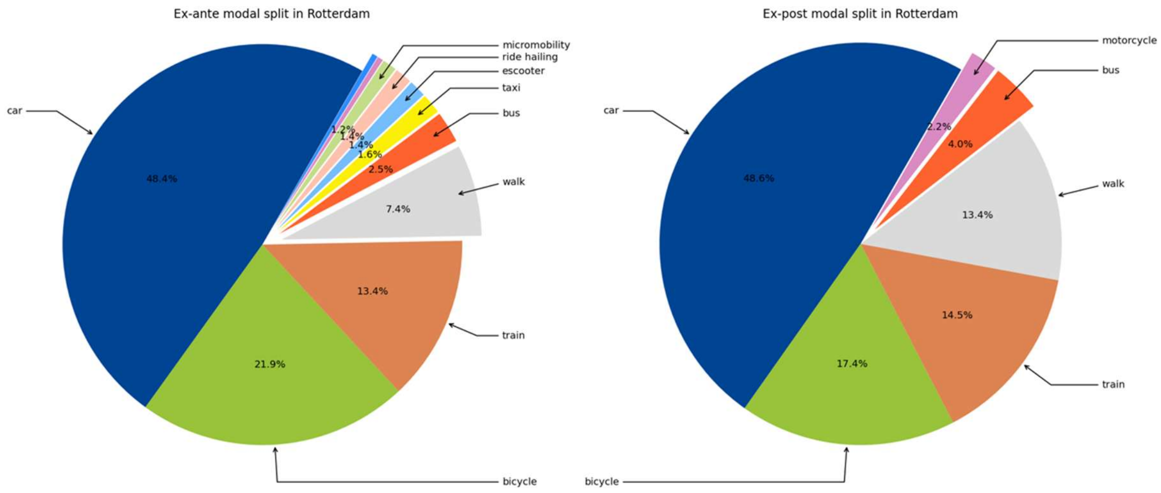
Due to this decentralized implementation approach, the survey coordinators (NTUA and UT) did not maintain full control over the quality, representativeness, or consistency of the collected samples. Most cities relied primarily on snowball sampling techniques. Additional details regarding the data collection process in each city are provided in Table 15**. The end date is the last month which appears the data records in each city**. The ex-ante data collection period extended over more than two months in most cases and, in certain LLs, covered nearly an entire year. In contrast, the ex-post data collection process was considerably faster and was largely completed during the first three months of 2026. Nevertheless, some cities, such as Geneva and Coimbra, had not yet reached the threshold of 103 valid responses at the time of analysis (May 2026). In the case of Fredrikstad, the ex-post survey was not included in the present analysis. Although travel diary data had been collected only a few months prior to January 2026, access to the raw dataset was not available. Instead, only aggregated descriptive statistics, such as modal split diagrams, were provided. Consequently, these responses could not be incorporated into the harmonized analytical dataset. All these deviations indicate the practical challenges associated with collecting comparable revealed-preference mobility data across nine different cities in Europe. They also highlight the inherent complexity of examining and monitoring general modal shift phenomena in multiple Living Labs.

Table 15: Overview of raw datasets (status in May 2026)

LL	Partners *involved in data collection*	Language	Ex-ante		Ex-post	
Rotterdam	RET	Dutch	October 2023 - January 2024	260	February 2026 - March 2026	202
Krakow	KRAKOW	Polish	October 2023 - December 2023	308	February 2026 - March 2026	224
Fredrikstad	FREDRIKSTAD	Norwegian	October 2023 - December 2023	201	ex-post survey was not conducted	
Larnaca	MOBY	Greek	October 2023 - December 2023	203	January 2026 - March 2026	231
Coimbra	COIMBRA	Portuguese	October 2023 - September 2024	201	March 2026 - April 2026	103

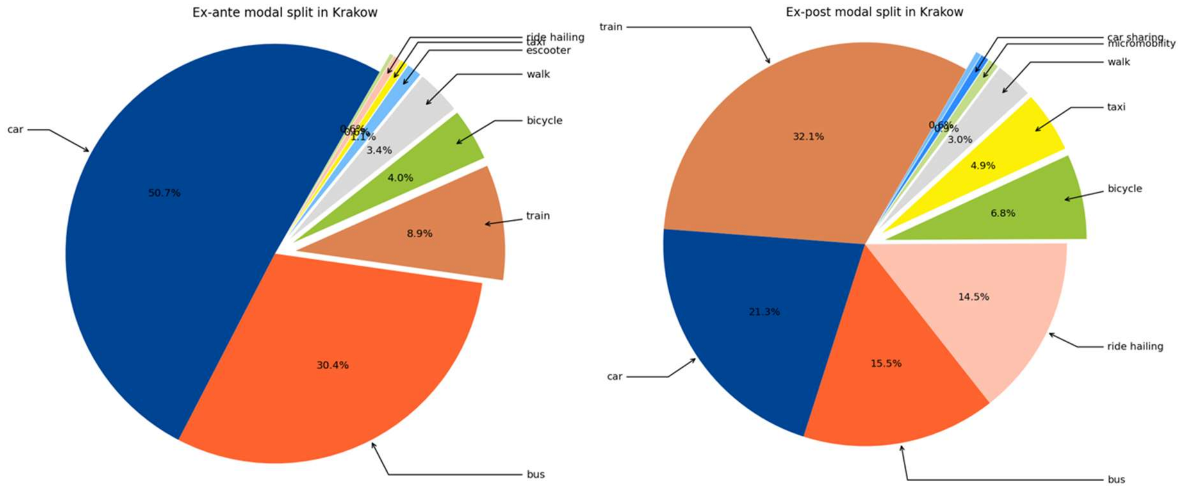
4.1.6.2 Main datasets

The Follower LLs exhibited some more promising trends. In Rotterdam, the share of walking trips increased from 7.5% to 13.4%, while bicycle use showed a moderate decline. At the same time, **the use of metro and tram services seem to increase by approximately 1.5% in the trip samples of Rotterdam**. It should also be noted that the ex-post dataset did not contain trips reported with NSMs as the main travel mode. **In Kraków**, the most remarkable changes appeared. **The share of ride-hailing services** (e.g. LajkBus) **increased substantially, from below 1% in the ex-ante dataset to 14.5% in the ex-post survey.** Simultaneously, train-related trips, mainly corresponding to tram services in the local context, increased from 8.9% to 32.1%. **These changes were accompanied by a great reduction in private car use, decreasing from 50.7% to 21.9%.** Particularly noteworthy were the results from the Larnaca. **In the ex-ante dataset, private car use remained dominant, reaching 85.8%. In comparison, the ex-post dataset reported a considerably lower share of 47.6% of reported trips in Larnaca.** Bus usage also increased substantially, reaching 34.0%, compared to 8.4% in the previous survey wave. Furthermore, e-scooter and bicycle use accounted for approximately 5.8% and 6.1% of reported trips. In Coimbra, private car use increased significantly, reaching 93.2% of reported trips in the ex-post dataset. This outcome is strongly associated with the timing of the survey implementation. The data collection period coincided with extreme weather events and flooding episodes in 2026, which likely influenced travel behavior, as it was reported in the diaries.



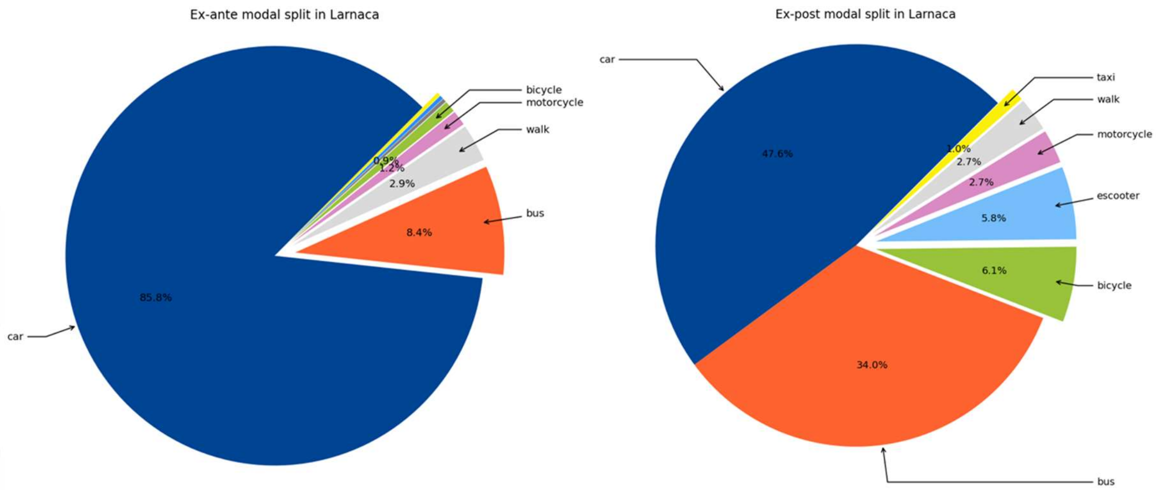
(a) (b)

Figure 44: Modal split (a) ex-ante and (b) ex-post in Rotterdam



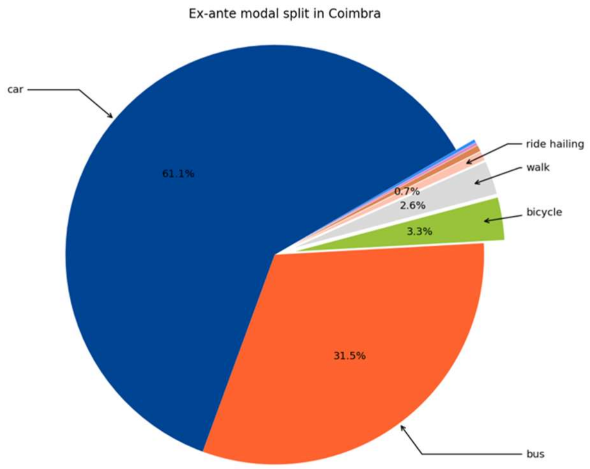
(a) (b)

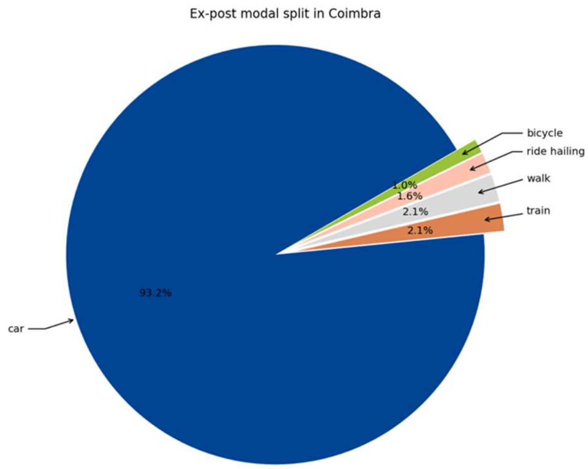
Figure 45: Modal split (a) ex-ante and (b) ex-post in Krakow



(a) (b)

Figure 46: Modal split (a) ex-ante and (b) ex-post in Larnaca





(a) (b)

Figure 47: Modal split (a) ex-ante and (b) ex-post in Coimbra

5 References

SUM Consortium (2023). *Grant Agreement No. 101103646 – Seamless Shared Urban Mobility (SUM).* European Union.

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