Deliverable 1.3:
Follower cities: status quo map and prototype ZESM use cases
WP1

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Abbreviations and Acronyms

ACRONYM	Description
AI	Artificial intelligence
AVs	Autonomous Vehicles
BIGMs	Business Innovation and Governance Models
CAVs	Connected Autonomous Vehicles
CCAM	Connected, Cooperative, and Automated Mobility
CCC	Climate City Contract
CINEA	European Climate, Infrastructure and Environment Executive Agency
CVs	Connected Vehicles
EU	European Union
EVs	Electric Vehicles
ITS	Intelligent Transportation Systems
KPIs	Key Performance Indicators
EVs	Electric Vehicles
LL	Living Labs
PT	Public Transport
SIEF	Standardized Impact Evaluation Framework
SUMP	Sustainable Urban Mobility Plan
TEN-T	Trans-European Transport Network
T-LL	Trailblazer Living Labs
F-LL	Follower Living Labs
UC	Use Case
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
V2X	Vehicle-to-Everything
WP	Work Package
ZESM	Zero Emission Smart Mobility

Background: About the metaCCAZE project

Transport is the second largest source of greenhouse gas emissions (GHG) and accounts for more than 30% of the total energy consumption. A series of global crises highlight the need for a significant shift from conventional vehicles to well-integrated, energy efficient, connected and automated passenger and freight services that meet the ambitious EU goals. To do so, a paradigm shift is required in the operations of electric vehicles that tackles their inherent vulnerabilities, including: the electric fleet-grid supply mismatch, the slow charging times, and the vehicle delays at charging stations. This requires automated charging processes, intelligent scheduling operations and matching to the grid, interconnectivity and automation of transport operations, and a shift from private cars to shared modes.

metaCCAZE is a Horizon Europe MISSION project co-funded by the 2Zero, CCAM and Cities' Mission partnerships. It participates in the CIVITAS Initiative, an EU-funded programme working to make sustainable and smart mobility a reality for all and contributes to the goals of the EU Mission Climate-Neutral and Smart Cities.

The metaCCAZE project aims to revolutionise mobility in European cities, serving both passengers and freight, with innovative electric, automated, and connected solutions designed to make transportation smarter, net zero, and more efficient for all. It builds on the expertise of 44 partners from 12 different European countries and contributes to the green metamobility era that the Green Deal, 2ZERO, CCAM, Cities Mission, CIVITAS and other EU initiatives aim to reach by 2030. In the vibrant streets of four trailblazer cities – Amsterdam, Munich, Limassol, and Tampere – metaCCAZE implements, tests and demonstrates cutting-edge technologies and services that support shared zero emission mobility solutions for people and goods, contributing to climate neutrality. Successful technologies and activities are transferred and implemented in six Follower Cities – Athens, Krakow, Gozo, Milan, Miskolc, and Poissy, Paris.

metaCCAZE organises a series of metaDesign activities and develops a toolkit called metaInnovations. This toolkit is pioneered in passenger and freight services (public transport, on-demand minibuses, bike and scooter sharing, deliveries) and related infrastructure (mobility and logistics hubs, traffic management centres, charging infrastructure, transport and energy integration) and widely demonstrated in our four trailblazer cities for a whole year. Successful metaInnovations and metaServices are transferred, implemented and demonstrated in the six follower cities for up to 8 months, to ensure their transferability and resilience potentials.

Executive Summary

This deliverable provides a detailed overview of the activities, methodologies, and progress achieved so far in the preliminary preparation of Follower Living Labs of the metaCCAZE project. This phase will focus on the replication and adaptation of innovative Use Cases (UCs) within the context of the Follower Living Labs (F-LLs). Building on the methodology established in the Trailblazer Living Labs (T-LLs) as described in D1.1, this deliverable presents the creation of the Status Quo Map for the six F-LLs: Athens, Krakow, Gozo, Milan, Miskolc, and the Yvelines Region.

The Status Quo Map serves as a foundational diagnostic tool that captures the current state of mobility systems, challenges, and stakeholder ecosystems within each Follower Living Lab. It provides an in-depth analysis of local urban mobility contexts, enabling the identification of preliminary barriers, opportunities, and key areas for innovation. The Status Quo Map establishes a well-defined foundation for structuring upcoming project activities, such as activating cross-fertilization efforts to learn from the experiences of the T-LLs and initiating co-creation processes of prototype UCs (Task 1.2) and BIGMs (Task 1.3) within the Follower Living Labs.

The Status Quo Map was developed for each of the F-LLs and structured around their preliminary definition of the UCs. The UCs that will be developed for each F-LL are so far defined as follows:

<u>Athens LL UCs:</u>

- *Optimised scheduling and route planning for Electric bus integration in Athens* (AT-UC01): Focuses on the holistic integration of e-buses to their existing bus operations utilizing operations research and AI-based algorithms.
- *Optimal planning of locations of e-chargers for the Athens electric bus network* (AT-UC02): Focuses on developing an efficient framework based on optimising charging system of the Athens's new electric bus fleet.

<u>Krakow LL UC:</u>

- *Multimodal passenger hub through the physical integration and monitoring of shared e-bikes and e-cargo bikes* (KR-UC01): Focuses on transforming the Kraków Grzegorzki railway station into a multimodal hub through the physical integration of shared e-bikes and e-cargo bikes. It also uses drone data to assess bicycle demand and safety along key cycling routes in the pilot area.

<u>Gozo-Malta LL UC:</u>

- *On-Demand automated e-bus services* (GM-UC01): Focuses on the implementation of an on-demand automated e-bus service along specific routes in Gozo.

<u>Milan LL UC:</u>

- *Development of an on-demand e-pod service designed to leverage the improved e-pods autonomous features* (MI-UC01): An on-demand e-pod service will be launched in suburban Milan to enhance first/last mile travel, integrating with local transport.

<u>Miskolc LL UCs:</u>

- *Multimodal passenger hub (MK-UC01):* Focuses on the integration of e-scooters into the public transport network at the Tapolca junction, creating a mobility hub for easy transfers.
- *Enhance the journey planning system for e-scooter (MK-UC02):* Focuses on enhancing the local journey planning system by integrating a multimodal route planner, including e-scooters, to offer sustainable transport options in the city centre.

<u>Paris LL UCs:</u>

- *Integrating connectivity and charging infrastructure (PO-UC01):* focuses on integrating advanced Vehicle-to-Everything (V2X) technologies into existing road infrastructure to enhance traffic efficiency and infrastructure management.
- *Shared Vehicle Services for Enhanced Mobility (PO-UC02):* case explores shared vehicle services—particularly carpooling with EVs and AVs—to improve connectivity from Poissy rail station, reduce single-occupancy trips, and promote sustainable mobility.

The analysis of the six Follower Living Labs highlights key mobility trends, challenges, and opportunities that will serve as a foundation for metaDesign and innovation in the upcoming phases. Notably, each city begins from a distinct mobility landscape, shaping the approach to sustainable solutions. For instance, while public transport is the dominant mode in Athens (52%) and Paris-Poissy (54%), Gozo remains heavily dependent on private cars (86%), emphasizing the urgent need for alternative mobility solutions. Milan presents a balanced transport network, whereas Krakow and Miskolc exhibit a mixed pattern of car dependandy alongside strong public transport usage. Walking and cycling remain secondary modes across most cities. These variations underscore the necessity for tailored interventions that address local mobility needs while aligning with broader sustainability goals.

Building on this analysis, cities with a Climate City Contract (CCC) demonstrate strong alignment with their objectives, and their Use Cases (UCs) are well-structured to support their goals. It emerged from the capability and empathy map that the key benefits include improved operational efficiency, cost reductions, data-driven innovation, and enhanced public transport reach. Financial savings, accessibility improvements, and optimized resource allocation further bolster mobility efforts. At the same time, Living Labs (LLs) showcase both opportunities and challenges in urban mobility projects. Recognizing early barriers such as regulatory hurdles in Athens and Milan, infrastructure constraints in Gozo-Malta and Krakow, or operational challenges in Milan and Paris-Poissy is crucial. Identifying these challenges at the initial stage allows them to be properly addressed during the co-creation process.

Past experience also plays a significant role in overcoming these obstacles. Many cities have prior involvement in similar mobility initiatives and related studies, providing valuable lessons that facilitate smoother implementation. Athens, Krakow, and Miskolc, for instance, benefit from past mobility projects, enabling them to navigate challenges more effectively and enhance the success of new initiatives.

Furthermore, a similar pattern emerges in stakeholder needs, revealing shared priorities and aligned outcomes. Understanding these needs early ensures that mobility solutions are not just technically feasible but also widely embraced and accepted. Strong governance, investment in infrastructure, and stakeholder engagement remain pivotal for successful UC deployment. By integrating these elements, cities can advance smart and sustainable urban mobility solutions that are both innovative and practical, ensuring long-term impact and adoption.

1. Introduction

1.1. Objectives of the Deliverable

This deliverable provides a comprehensive overview and detailed description of the activities undertaken within the metaCCAZE project, focusing on the preliminary work essential for co-designing and shaping of ten innovative Use Cases (UCs). In the context of the metaCCAZE project, a Use Case (UC) represents an innovative service for zero-emission people mobility and/or freight transport, addressing specific challenges identified within the project for a designated area in each metaCCAZE Living Lab. Each UC integrates various measures that combine metaServices and metaInnovations to achieve common objectives. Throughout the project, each UC will be prototyped, developed, and refined through metaDesign (co-creation) activities. These UCs will be implemented and demonstrated in six Follower Living Labs (F-LLs) located in Athens, Krakow, Gozo, Milan, Miskolc and Yvelines Region with the goal of accelerating the deployment of smart, shared, zero-emission mobility solutions for both passengers and freight in these cities. The content outlined in this deliverable is inspired by and build upon the experiences and knowledge gained from the Trailblazer Living Labs (T-LLs).

This document details the foundational work carried out across the six F-LLs from September 2024 to January 2025, focusing on the development of the Status Quo Map. This map provides a preliminary assessment of each F-LL's current capabilities, stakeholder needs, available resources, and data availability. It establishes a solid foundation for subsequent activities and aligns with the broader metaCCAZE objectives.

1.2. Structure of the Document

This deliverable begins with an introductory chapter that provides context and outlines the purpose of the document, setting the stage for the subsequent sections. The document is then divided into three main chapters:

- Chapter 2 - This chapter outlines the methodology used to assess the current situation in each F-LL, focusing on capability, empathy, and data mapping.
- Chapter 3 -It presents a detailed Status Quo Map for each city, summarizing the findings and establishing a foundation for the future development of prototype UCs and BIGMs.
- Chapter 4 – Presents the summary of the Status Quo Map and introduces the next steps.

In addition to its four chapters, the document includes two annexes:

- Annex I - Summary of Data Map: Summarizes the availability of mobility and traffic data across T-LLs.
- Annex II - Data Map for Each T-LL: Comprehensive data maps for the four T-LL cities, detailing data categories, sources, formats, and other relevant information.

1.3. Relation to Project Documents

This document is the third in a series of deliverables under Work Package 1 (WP1). It aligns with Deliverable D6.1 - Project Handbook (Inception, Quality, and Risk Management), particularly in terms of management structures and risk management procedures. It builds upon Deliverable "D1.1 - Trailblazer LLs: status quo map, protptype ZESM use cases for passengers and freight", which had similar objectives but focused on establishing the groundwork for co-designing and shaping Use Cases (UCs) specifically for the Trailblazer Living Labs (T-LLs). In contrast, this deliverable shifts the focus to the Follower Living Labs (F-LLs).

Moreover, this document will serve as the foundation for the work to be undertaken in the coming months, focusing on the development and subsequent refinement of UCs and BIGMs for the F-LLs.

These efforts aim to guide the implementation of smart, shared, zero-emission mobility solutions within WP4. The iterative process of refining and validating these concepts will also be documented in Deliverable "D1.5 - MetaDesigned transferable ZESM yse cases for the follower LLs", which will present the final UCs and BIGMs to be transferred to WP4 for implementation and demonstration.

Deliverable "D1.2 - Cross-fertilisation and transferability framework and guidelines", complements this document by providing the framework and details regarding cross-fertilization activities and specifications for transferability between the T-LLs and F-LLs. It outlines how the F-LLs will transition from their current state to gradually adopt solutions tested by the T-LLs, while adapting these solutions to fit the local context and specific needs of the F-LLs.

1.4. Overall Approach

This deliverable was collaboratively developed by the Task 1.1 leader, sub-task leaders, Living Lab leaders and support partners. It was led by TRT, focusing on coordinating and addressing Sustainable Urban Mobility Plans (SUMP), Climate City Contracts (CCC), and Resources Mapping. The process was co-led by BABLE, which concentrated on stakeholder and user needs specification, and NTUA, which analyzed cities' available data.

The methodology mirrored the approach used for the T-LLs during the initial five months of the project while preparing the Status Quo Maps for Deliverable D1.1. F-LL partners, including leaders and supporters, contributed content specific to their respective LLs. These contributions provided insights into the Status Quo and UCs. Subsequently, these inputs were refined to ensure consistency and comparability across the six F-LLs. Task 1.1 lead partners reviewed, elaborated on, and interpreted these contributions before seeking further validation from F-LL partners and consortium experts.

Key project documents, including the Grant Agreement and Deliverable 6.1 (Project Handbook), were carefully reviewed to ensure alignment with the overarching project framework and adherence to quality standards.

The deliverable aligns closely with the metaDesign framework, introduced by BABLE in Task 1.6, which elaborates on fertilization methodologies within LLs. This framework prioritizes stakeholder involvement, including citizens, in co-creating UCs and Business Innovation and Governance Models (BIGMs). The approach ensures that the solutions developed are technically sound, socially accepted, and aligned with both stakeholder and user needs. Specifically, this initial phase incorporates mini-dialogues with LL stakeholders to understand user needs.

This approach not only reflects the collective vision of the metaCCAZE project but also establishes a foundation for impactful metaServices and metaInnovations during crossfertilization procees with T-LLs as well as the future implementation and demonstration phases in WP4.

The document is structured around the six metaCCAZE Follower cities and their ten UCs. The table below provides an overview of these UCs, including their unique codes and titles, to guide readers through the document.

Table 1: Follower Living Lab's Use Cases

LL	UC CODE	UC TITLE
Athens	AT-UC01	Optimised scheduling and route planning for Electric bus integration in Athens
	AT-UC02	Optimal planning of locations of e-chargers for the Athens electric bus network
Krakow	KR-UC01-A	Multimodal passenger hub

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	KR-UC01-B	E-cargo bikes & e-bikes demand and monitoring
Gozo	GM-UC01	On-Demand automated e-bus services
Milan	MI-UC01	Development of an on-demand e-pod service designed to leverage the improved e-pods autonomous features
Miskolc	MK-UC01	Multimodal passenger hub
	MK-UC02	Enhance the journey planning system for e-scooter
Paris-Poissy	PO-UC01	Integrating connectivity and charging infrastructure
	PO-UC02	Shared Vehicle Services for Enhanced Mobility

The following chapters expand on this introduction by presenting the Status Quo Map for each city. This includes general city information, its key characteristics, and an understanding of the cities' mobility and sustainability goals aimed at achieving zero-emission mobility.

Moreover, the deliverable evaluates the alignment of the preliminary descriptions of UCs with SUMP and CCC objectives. It identifies initial barriers, capabilities, and available resources while addressing user and stakeholder needs. This comprehensive understanding of each city's local context establishes a strong foundation for the metaCCAZE FLLs to thrive and contribute meaningfully to the project's goals.

2. Status Quo Map Methodology

The development of the Status Quo map (Task 1.1) follows a comprehensive and structured approach aimed at evaluating the current situation of the F-LLs in terms of capability (SUMP, CCC and Resources Mapping), empathy (stakeholders' specific needs), and data (availability of datasets). This process aims to understand each F-LL's readiness and establish a solid foundation for preparing metaCCAZE demonstrations. The Status Quo map will establish a well-defined basis for shaping the other WP1 project activities, such as the prototype UCs (Task 1.2) and BIGMs (Task 1.3), as well as the set of KPIs to be integrated into the Impact Evaluation Framework (Task 1.4), and the Social Embracement surveys (Task 1.5). Currently deployed in the T-LLs, these activities will be mirrored for the F-LLs in the following months, accompanied by cross-fertilization initiatives to ensure knowledge transfer and contextual adaptation.

This chapter presents the methodology used to build the Status Quo map, followed by the specific six F-LLs maps and a summary of the findings. The methodology is divided into three interconnected sub-tasks:

- SUMP and Resources Mapping or ***Capability Map*** (Sub-task 1.1.1);
- Ecosystem Dialogues for Needs Specification or ***Empathy Map*** (Sub-task 1.1.2);
- Identification of Cities' Available Data or ***Data Map*** (Sub-task 1.1.3)

The outputs of these sub-tasks were synthesized and cross-analyzed to create a comprehensive Status Quo Map for each city. This section elaborates on the methodologies applied to accomplish these three fundamental components.

2.1. Capability map methodology

The SUMP and Resources Mapping, referred to as the Capability Map, serves to pinpoint the initial positioning of each F-LL. This foundational step is crucial for refining the UCs and BIGMs that will be prepared in the coming months. It evaluates the initial concepts and existing smart systems and services in each F-LL to gauge their current status and assess their potential to achieve zero-emission mobility goals.

The Capability Map also draws insights from past experiences by analyzing the lessons learned, recurring challenges, and existing barriers associated with smart systems and services in each city. It reviews research and innovation outcomes from prior initiatives, such as 2ZERO, CCAM, and EU MISSION – Climate Neutral and Smart cities, to identify opportunities for leveraging these findings within the metaCCAZE framework.

Moreover, the map examines each F-LL's Sustainable Urban Mobility Plan (SUMP) or equivalent strategic transport plans alongside their Climate City Contract (CCC). This analysis establishes a baseline and clarifies the broader goals and targets of each city.

To execute this task, each city—supported by their respective partner—adhered to a standardized process by completing a detailed template (refer to Annex II) covering the following areas:

- General city information and key characteristics.
- Status and description of CCC actions, with an emphasis on urban mobility and smart zero-emission solutions.
- SUMP goals, targets, and alignment with zero-emission objectives.
- Existing systems and services for zero-emission mobility, including functionalities, challenges, and proposed SUMP solutions with relevant KPIs.

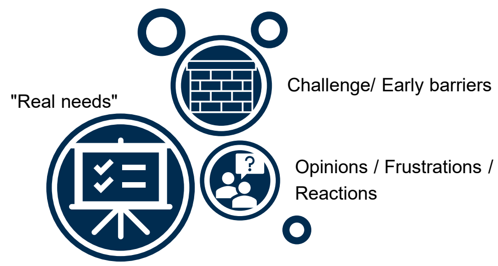
- Preliminary descriptions of UCs, focusing on alignment with SUMP and CCC objectives, identifying initial barriers, and incorporating insights from past studies or pilot projects.
- Research and innovation outcomes from prior initiatives like 2ZERO, CCAM, and EU MISSION – Climate Neutral and Smart cities, relevant to Living Lab measures and their applicability and scalability within metaCCAZE.
- Communication tools and media channels essential for implementing Living Labs and fostering effective local stakeholder engagement for project activities.

This harmonized approach ensured consistency across different LLs and UCs, providing a comprehensive overview of available resources and capabilities. Through iterative analysis and follow ups, the gathered data was systematically refined, integrated, and presented in a unified structure.

2.2. Empathy map methodology

The ecosystem dialogues for needs specification, or Empathy map, has been designed as a tool to gain a deeper understanding of the Living Labs' target audiences by capturing what they think, feel, see, hear, say, and do, as well as their pains and gains.

This exercise has been also adopted in line with the preparation of the guidelines of the metaDesign activities (T1.6.1), specifically through the organization of mini dialogues (metaDesign activity LL1) during months 11-13 (November 2024 - January 2025) of the project. The mini dialogues aimed at discussing and specifying the needs of stakeholders involved in the LL's SUMP. All-in-all, the 3 main expected outcomes from the mini-dialogue exercises were discovering a) the real needs, b) the early barriers, and c) specific opinions on the use cases.



To help guide the previous, the following questions were shared, in a form of aggregated and adapted Empathy map canvas.

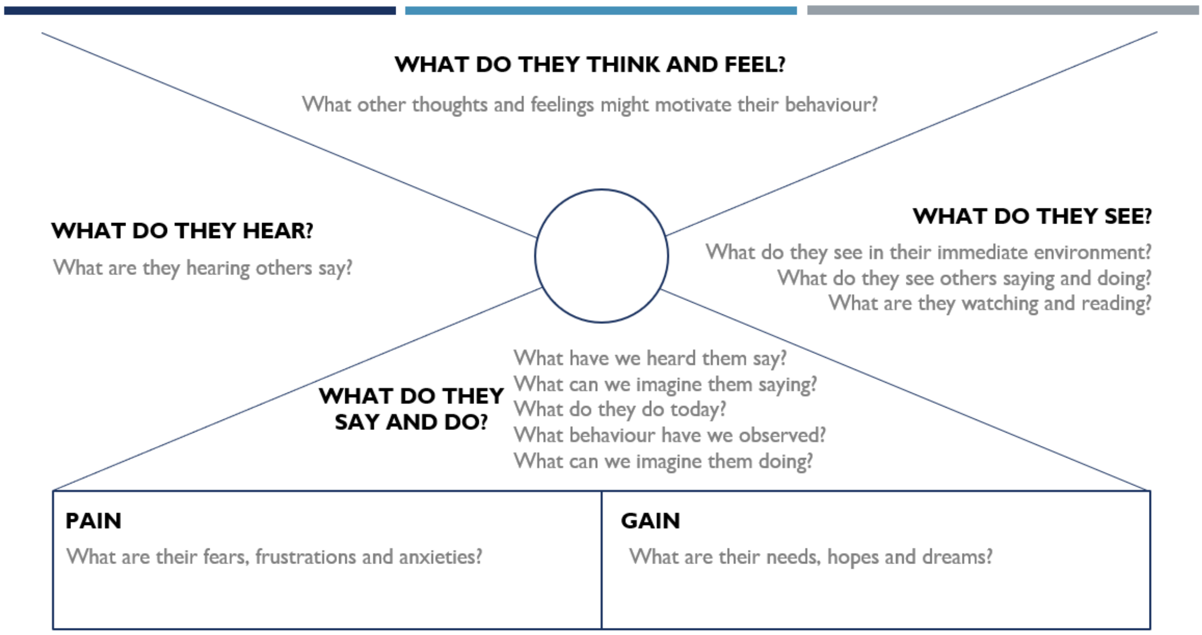


Figure 1. Adapted Empathy map canvas sent to the Living Labs to guide the activities (Credits: BABLE)

The six F-LLs were invited to take part in the realisation of the mini-dialogues, having provided specific information on:

- The overall need of the project from the cities and city supporters,
- A clear definition of the goal of the Task,
- Specifications on how to carry out the Task – letting each LL decide which way was more appropriate considering their context,
- Guidance on the definition of the relevant stakeholders. Lead for the next steps,

The LLs could choose to organise in-person events or carry out the activity online with hybrid events/dialogues with relevant stakeholders following each city's circumstances or preferred approach. The following table summarises how each city has carried out the activity.

Table 2: MetaDesign activity LL1: mini-dialogues

CITY	FORMAT	ACHIEVED ON:
Athens	1:1 interviews	6.11.2024
	Online Event	8.11.2024
Krakow	Physical Event (pre-assessment of LL ecosystem)	09.06.2024
	Physical Event	15.11.2024
Gozo	Physical event	11.11.2024
	Physical event	13.11.2024
Milan	Online event	03.12.2024
Miskolc	Physical event	14.11.2024
Paris-Poissy	Virtual Event	24.01.2025

The results of these events were analysed individually and are detailed under each UC for each F-LL, providing detailed information on the characteristics and nature of the event, the participants involved, and the main outcomes.

2.3. Data map methodology

The scope of the data map involves identifying all necessary, city-specific data from available secondary sources, existing models and simulation datasets, and previous co-creative labs. Key principles for the Data Map include ensuring available data is suitable for monitoring and impact evaluation, which requires before-and-after data as well as time-series data. It is crucial to exploit existing data infrastructure, encompassing mobility data (traffic, public transport, active travel, public space, etc.) and city data (economic and social metrics). This information, along with the results of the capability and empathy map, will serve as the foundation for selecting KPIs for each UC to include in the Evaluation Framework.

For the construction of the Data Map for each city, the following principles were followed:

1. **Consistency:** Consistency in data means collecting and formatting the data in the same way across all sources or time periods. When consistent methods are used, it becomes much easier to compare and analyse the data, which leads to more accurate identification of trends and patterns. By applying the same approach, such as using the same units of measurement, data categories, or collection techniques, you ensure that the data is reliable and can be meaningfully compared, leading to clearer insights and better decision-making.
2. **High-quality:** Ensuring data is reliable, accurate, and up-to-date enhances the credibility of metaCCAZE outcomes. High-quality data promotes trustworthiness in the results and supports evidence-based decision-making, allowing for more informed and effective conclusions or actions.
3. **Compatibility:** When data is structured in a way that aligns with common formats or standards, it's easier to integrate with other datasets, even if they track different KPIs. This flexibility facilitates collaboration and enables a broader understanding of complex issues across different areas, as diverse data sources can be combined and analysed seamlessly.
4. **Efficiency:** Implementing standardized practices saves time and effort by creating more streamlined workflows. It enables teams to work more efficiently, minimizes errors, and maximizes the effective use of resources. By following consistent procedures, organizations can focus on productivity and better outcomes rather than addressing inefficiencies or correcting mistakes.
5. **Transparency and trust:** By documenting where the data comes from, how it's collected, and how its quality is ensured, we build trust with stakeholders. This transparency makes metaCCAZE more credible and accountable.

To ensure comprehensive data collection and infrastructure support within the metaCCAZE project, it is essential to achieve uniform coverage across all relevant categories of vehicles, services, and technologies for each use case of each Living Lab, assuring the proper data are being collected in each case. Considering the comprehensive coverage required for all UCs, a proposed set of data has been consolidated.

This data map ensures that not only the UCs but also all categories of vehicles, services and technologies that may be included are thoroughly considered and incorporated to support the metaCCAZE project effectively. The data categories to be gathered from F-LLs cities can be depicted in the next table.

Table 3: Data categories and data variables included in the Data Map

DATA CATEGORIES	DATA VARIABLES	DESCRIPTION
Traffic Data	Average Daily Traffic (ADT)	Number of vehicles passing through a specific location on a road or highway within a day
	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow
	Vehicle Types and Classifications	Distribution of vehicle types (e.g., cars, trucks, buses, bicycles)
	Origin-Destination Data	Origin and destination of trips, commuter and freight traffic
	Traffic Volume	Number of vehicles passing through a specific point or section of road within a given time frame
	Traffic Density	Measure of vehicle concentration per unit length of road
	Average Speed	Mean speed of vehicles along a road segment or corridor

	Free Flow Speed	Speed vehicles would travel at under ideal conditions, unaffected by congestion
	Congestion Index	Measure of traffic congestion level, often based on travel time compared to free-flow conditions
	Queue Length (Intersections / Bottlenecks)	Length of vehicle queues at intersections or bottlenecks during peak hours
	Lane Utilization - Lane Capacity	Proportion of lane capacity utilized by vehicles, indicating traffic density
	Delay Time	Additional time spent by vehicles in traffic congestion compared to free-flow conditions
	Flow Distribution	Distribution of traffic flow across different routes or road segments
	Peak Hour Traffic	Traffic volume and flow patterns during peak hours of the day
PT data	Ridership Statistics	Number of passengers using public transit services
	Frequency and Reliability	Frequency of public transit services and reliability
	Accessibility of Stops and Stations	Availability and accessibility of public transit stops and stations
Charging Infrastructure	Number and Locations of Charging Stations	Count and geographical distribution of electric vehicle (EV) charging stations
	Charging Capacity and Compatibility	Charging rates and compatibility with different EV models
	Utilisation Rates	Usage patterns and utilization rates of charging stations
	Availability of Fast Charging	Presence and distribution of fast charging stations
Transport Network	Road Network Characteristics	Lane widths, speed limits, classifications
	Bicycle and Pedestrian Infrastructure	Availability of bike lanes, sidewalks, crosswalks
	Freight Routes and Distribution Centres	Routes and hubs for freight transportation
	Public Transport Stops and Stations	Locations of bus stops, train stations, and transit hubs
Transport Technology	Intelligent Transport Systems (ITS)	Technologies used for traffic management and control
	Vehicle-to-Infrastructure (V2I) Communication	Communication technologies between vehicles and infrastructure
	Vehicle-to-Vehicle (V2V) Communication	Communication technologies between vehicles
	Advanced Driver Assistance Systems (ADAS)	Adoption and prevalence of ADAS technologies
Travel Behaviour	Travel Survey Data	Mode choice, trip purposes, trip lengths
	Commuting Patterns	Commuting modes and travel times
	Ride-Sharing and Micro-mobility	Usage rates and preferences for ridesharing, micromobility
Environmental Impact	Air Quality Monitoring Data	Pollutant concentrations, emissions
	Noise Pollution Levels	Levels of noise pollution along transport corridors

	Greenhouse Gas Emissions Inventory	Emissions from transport sources
Social Impact	Demographic Profiles	Characteristics of communities served by transport infrastructure
	Accessibility for Vulnerable Populations	Accessibility barriers for vulnerable populations
	Public Perception Surveys	Public attitudes and perceptions towards transport
Economic Impact	Transportation Expenditures	Costs related to transportation, fuel, maintenance
	Economic Benefits of Transport Investments	Job creation, business growth resulting from investments
	Cost-Benefit Analysis	Costs and benefits associated with transport projects

As was done during the initial months of the project for the T-LLs, a standardized approach was used to collect and analyze information from the F-LLs to ensure consistency and facilitate a clear understanding of the data available in each city. An Excel file with predefined fields and answer options was distributed to all F-LLs, requiring them to provide as much detail as possible for each dataset listed in the Data Map, classified according to the categories outlined in the table above.

For each dataset, the following variables were requested: availability, type, source, date of the last update, spatial coverage, quality, collection method, temporal resolution, spatial resolution, format, access restrictions, aggregation level, source reliability, and usage restrictions. To simplify this process, predefined options were provided for each variable to ensure consistency in responses and reduce ambiguity.

In addition, the F-LLs were asked to provide information about their available data, concerning mainly three different levels: i) Data generally available for all cities; ii) Specific data for each city according to the Use Cases they will be implementing within metaCCAZE; and iii) Any other data that was not included in the provided initial list, but T-LLs cities might want to consider.

The data collected from the F-LLs was analyzed individually and summarized for each city. These results are presented in detail in the Data Map section of this deliverable. The full version of the Data Map for each city, along with a comparison of common variables across the T-LLs and F-LLs, is discussed in Annex I and Annex II.

The outcomes of the three sub-tasks—capability mapping, empathy mapping, and data mapping—were consolidated and compared to create a comprehensive ***Status Quo Map for each F-LL***. These maps are presented in the following sections and serve as a foundation for the subsequent project activities.

3. Status Quo Map for the 6 Follower Living Labs

3.1. Status Quo Map for Athens

Athens, Greece's vibrant capital, boasts a population of around 3.15 million and serves as the country's political, economic, and cultural heart. Nestled in the Attica region, it is home to iconic historical sites like the Acropolis and Parthenon, attracting millions of visitors each year. The city also excels in education, housing top universities such as the National Technical University of Athens (NTUA) and the National and Kapodistrian University of Athens (NKUA). Athens' economy thrives in areas like tourism, shipping, finance, and trade, with the tech sector rapidly expanding. In its commitment to sustainability, Athens is making significant progress through green initiatives and urban regeneration projects.

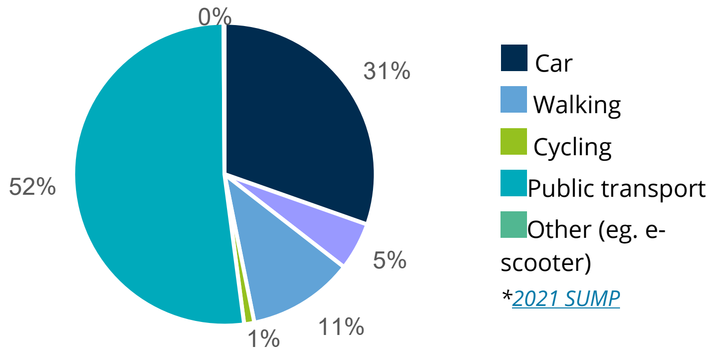
In terms of sustainability, Athens is making notable strides with various green initiatives and urban regeneration projects aimed at improving the quality of life for its residents. It is selected as one of the 100 cities in the EU Mission for 100 climate neutral and smart cities by 2030. Athens is an urban node in the TEN-T (Trans-European Transport Network), strategically located at the intersection of the Mediterranean corridor and the Rhine-Danube corridor.

The Mediterranean corridor connects ports in the Mediterranean (including Athens) with central and northern Europe, while the Rhine-Danube corridor facilitates trade and transport between western Europe and the Balkans. Athens, as a key city along these corridors, plays a crucial role in connecting Greece to the rest of Europe, improving both passenger and freight mobility, and enhancing regional integration within the broader TEN-T network.

A FEW FACTS…

Athens is one of the MISSION CITIES, but by the time this report was drafted, it had not yet signed the Climate City Contract.

643.452 inhabitants



*2021 SUMP

Key facts:

political, economic, and cultural heart of the country #Tourism #History #Shipping #Educational Hub

TEN-T Comprehensive network:
Intersection of Rhine-Danube - Mediterranean corridors

Sustainable mobility strategies:

- Athens is one of the MISSION CITIES – committed to achieve climate-neutrality by 2030
- Its "EU Mission Label" is still in process
- The Sustainable Urban Mobility Plan for the municipality of Athens was approved in 2021 and has been developed with a time horizon of 5 years (2026) and 10 years (2031).

3.1.1. Sustainable mobility planning policies

The Sustainable Urban Mobility Plan for the municipality of Athens was approved in 2021 and has been developed with a time horizon of 5 years (2026) and 10 years (2031).

Timing:

2019 Today 2026	2031
Install 50 electric charging points in municipal, private and public spaces	Install 70 electric charging points in municipal, private and public spaces
5% out of total public transport fleet must be clean vehicles	10% out of the total public transport fleet must be clean vehicles
70 locations for placing shared rental bicycles in the Municipality	150 locations for placing shared rental bicycles in the Municipality
15% of electric bicycles in the shared-use system	30% of electric bicycles in the shared-use system
1 per 6600 - Car sharing with conventional and electric city cars (Location per residents)	1 per 2200 - Car sharing with conventional and electric city cars (Location per residents)

Figure 2. Sustainable mobility planning policies main targets - Athens

Geographical scope:

The geographical scope of the SUMP encompasses the administrative boundaries of the Municipality of Athens.

Sustainable mobility monitoring schemes:

In Greece, the monitoring of Sustainable Urban Mobility Plans (SUMPs) is governed by Law 4784/2021[1], which mandates that municipalities and regional authorities conduct a progress report every two years during the implementation phase of their SUMP. These reports assess progress based on SMART (Specific, Measurable, Achievable, Relevant, Time-bound) targets and indicators established during the plan's development.

3.1.2. Climate City Contract policies and metaCCAZE alignment

Athens is one of the MISSION CITIES and is committed to achieving climate neutrality by 2030. Although the Climate City Contract (CCC) has not been signed yet, and therefore the city has not received its "EU Mission Label," it has already identified key actions.

The following table presents a list of the anticipated actions related to urban mobility that will be included in the CCC. For each action, it is indicated whether the metaDesigned UCs will contribute (or not) to their implementation.

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[1] Law 4784/2021 for monitoring SUMPS in Greece - https://urban-mobility-observatory.transport.ec.europa.eu/sustainable-urban-mobility-plans/member-state-profiles/greece_en?utm_source=chatgpt.com

Table 4: Policies contained in the CCC of Athens

POLICIES CONTAINED IN THE DRAFT CCC	UC
Public Transportation Electrification ○ Design of municipal transportation with electric buses	✓
Micro-mobility ○ Actively promoting pedestrian movement, cycling, green public transportation, and municipal transit. This includes creating more playgrounds and public spaces. ○ Expansion of the bicycle lane network. ○ Upgrading and widening sidewalks	✗
Private Vehicle Electrification ○ Installation of electric vehicle chargers in municipal buildings	✗
Freight and Logisitics Optimisation ○ Measures to optimize truck logistics within the city (e.g., loading program).	✗
Urban Planning Development ○ Creation of pilot Superblocks and 15-minute neighbourhoods	✗
Traffic and Parking Management ○ Reducing car and motorcycle traffic within the municipality, along with supportive measures to reduce parking in the centre of Athens	✗

3.1.3. Athens's UCs - Resources and needs

As anticipated in the introduction, Athens proposes two Use Cases that will be tested within metaCCAZE.

- *AT-UC01 - Integration of e-buses in a public transport system and fleet optimisation*
- *AT-UC02 - Efficient setup of e-charging infrastructure for public transport systems*

For each UC, a summary of the key takeaways of the ***capability map*** and ***empathy map*** are presented.

The following sections build on the information collected by the Athens Living Lab partners and NTUA, the Support Partner. For each UC, they provide a description of the measures to be implemented within metaCCAZE, along with the preliminary barriers, existing services potentially related to each UC, and relevant projects, studies, and past experiences that could be leveraged. In addition, the sections include the main outcomes of the mini dialogues hosted in Athens during November 2024.

3.1.3.1. Integration of e-buses in a public transport system and fleet optimisation (AT-UC01)

Table 5: Athens Use Case 1 - capability

<table>
<tr><th colspan="4">USE CASE AT-UC01</th></tr>
<tr><th colspan="4">Optimised scheduling and route planning for electric bus integration in Athens</th></tr>
<tr><td>USE CASE DESCRIPTION</td><td colspan="3">OASA, the Athens public transport authority, and OSY, its subsidiary managing bus operations, have introduced 140 electric buses over the past year, supported by slow chargers with a 180 kW output to bring the fleet into full operation. Despite this progress, the complete integration of these buses into the existing transportation system remains a work in progress. To facilitate this transition, advanced Operations research and AI-based algorithms will be applied to optimize vehicle schedules and driver duties while accommodating both slow and fast charging requirements. NTUA will contribute by developing a Multi Depot Electric Vehicle Scheduling Problem (MD-E-VSP) model to guide stakeholders at the Athens living lab. Additionally, addressing strategic concerns such as the autonomy limitations of the new fleet, the LL will create a Line Planning Model for Electric Buses (EV-LPP) to refine route planning. Both models will also evaluate “What-if” scenarios using data from other related use cases and charging infrastructure planning to further support the shift to electric mobility.</td></tr>
<tr><td>AREA DESCRIPTION</td><td colspan="3">This initiative will focus on the municipality of Athens, encompassing its historic centre, central business districts, and major transportation hubs, covering an area of 38.96 square kilometres and serving a population of approximately 643,452 residents.

It is currently estimated that 78 bus lines traverse the Municipality of Athens, out of a total of 280 bus lines managed by the Athens Urban Transport Organization (OASA) within the Attica region. Additionally, approximately 10 bus lines operate exclusively within the municipal boundaries, warranting greater analytical emphasis within the Use Case. In conjunction with the three existing metro lines and a single tram line, these public transportation services facilitate connectivity between the Municipality of Athens and the broader Attica region. The planned introduction of a fourth metro line, which will intersect the Municipality of Athens and the services, presents opportunities for enhanced scheduling coordination and intermodal synergies across the public transportation network</td></tr>
<tr><th>OBJECTIVES</th><th>Alignment with:</th><th>MOBILITY STRATEGIES</th><th>CCC</th></tr>
<tr><td colspan="2">Optimise new vehicle schedules (blocks) and driver schedules (duties) for the newly acquired fleet of electric buses</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="2">Reduce running times of electric buses</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="2">Reduce rostering costs</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="2">Reduce charging requirements with the development of new line plans</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="2">Reduce deadheading times and operational downtimes of electric buses due to charging needs</td><td>✓</td><td>✓</td></tr>
<tr><th colspan="4">BARRIERS</th></tr>
</table>

1. **Regulatory uncertainties**: as the transition to electric mobility is in its early stages in many areas in Greece, the lack of regulations for the safe operation of maintenance and parking facilities for electric buses can bring delays in the overall organization of the operation of electric vehicle fleets.
2. **Skills and Training Gaps:** Limited access to specialized training and certification programs for electric bus drivers and maintenance personnel may present challenges in ensuring the operational readiness of the electric fleet.
3. **Potential delays in procurement and administrative procedures:** The acquisition and installation of charging equipment, as well as the recruitment of necessary personnel, involve standard procurement and approval processes that may require additional time, but proactive coordination will allow to minimize or mitigate any impact on the pilot's implementation. .
4. **Inaccuracy of input data:** Data collected need to be based on real-time bus monitoring systems. That could cause connectivity issues and data accuracy limitations. This can cause inaccuracies concerning the input data at the developed model.

PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC

EBRT2030 (2023-2026)[2]: This project aims to develop a new generation of advanced, fully electric urban and peri-urban Bus Rapid Transit (BRT) systems. These systems incorporate innovative automation and connectivity features to enhance sustainable urban mobility. The project targets reductions in cost per kilometer per passenger, total cost of ownership (TCO), greenhouse gas (GHG) emissions, air pollutants, and traffic congestion. The project is structured around three core objectives:

- **Technology development:** Designing and implementing key innovations at both system and subsystem levels. This includes advancements in vehicle design, infrastructure, operational strategies, and IoT-based connectivity tailored for BRT systems.
- **Demonstration pilots:** Conducting seven real-world demonstrations of innovative BRT solutions. These pilots, held in cities across Europe and internationally (Latin America and East Africa), will focus on operator-led, city-led, or subsystem-specific technological innovations that integrate seamlessly into broader urban mobility ecosystems.
- **European BRT concept for 2030:** Defining a forward-looking vision for European BRT systems that builds on insights from the real-world demonstrations. This will drive improvements in the performance and scalability of urban bus systems while leveraging electrification, automation, and connectivity technologies optimized for European contexts.

Athens, as one of the seven demonstration cities, plays a critical role in piloting these innovative BRT solutions. OASA's efforts within the project are centered on real-operation testing in Athens, advancing the city's commitment to sustainable and cutting-edge urban transport solutions.

RELATED EXISTING SERVICES	BARRIERS / SOLUTIONS FROM CITY'S MOBIILITY STRATEGIES
OASA Telematics: Monitor and Management of electric and conventional bus trips and provide	Barriers: Currently the IT systems of OASA offer electric fleet monitoring capabilities but do not include intelligent features that could support the transition to electric mobility. Solutions: Through the metaCCAZE UCs and metaInnovations delivered for Athens LL, the data from the IT systems of OASA will be

[2] For more information, visit the project's website: https://ebrt2030.eu/

information to passengers through smartphone apps and infrastructure telematics at bus stops.	expanded in order to support the public transport authority in its transition to electric vehicles fleets. Specifically, some of the decision support and insights that will be delivered to OASA will be focused on the positioning of the charging stations as well as the vehicle and crew scheduling processes
STAKEHOLDERS LIST	
Public entities/Academia	Municipality of Athens Region of Attica Sustainable Mobility Unit (NTUA)
Private stakeholders /businesses /operators:	Road Transport S.A. (OSY)* Public Transport Authority OASA* Anaplassis - State Agency * Energy management authority (DEI) Energy grid operator (DEDIE)
Citizens groups/associations	Astylab WeFor Hellenic Institute of Electric Vehicles Helenic Institute of Transportation Engineers CIVINET Greece-Cyprus

** Stakeholders highlighted with a (*) have participated in the mini dialogue (see below)*

Mini-dialogue for Athens UC01 (AT-UC01)

For the Athens Use Case concerning Integration of e-buses in a public transport system and fleet optimisation, the mini dialogues were held during November 2024 and consisted of a 1-on-1 meeting with the supervising public transport authority (OASA) and the bus services operator (OSY), as well as an additional Teams meeting with the state agency (Anaplassis). The insights were collected with the aid of a shared miro board. The inputs collected during the discussions were elaborated using the Empathy Map methodology and are summarized in the following table.

Table 5: Athens Use Case 1 - empathy

STAKEHOLDERS'PERSPECTIVE	
Identification of real needs:	• Expressed the need for a reliable and efficient PT system, highlighting the importance of environmental sustainability. • Advocated for better infrastructure, participating in discussions about public transport improvements, and using e-buses when available. • Any proposed service must be extremely efficient and competitive to persuade people to forgo using private cars.
Identification of early barriers/concerns:	• Athens has a dominant car and motorcycle ownership culture. • Citizens are very reluctant in transitioning to public transport from private vehicles. • Reduced trust in the PT system, potential resistance from passengers and drivers. • Concerned about delays in charging of e-buses, people may not trust the public transport system, leading to a lack of acceptance.

	• The absence of legislation and safety regulations for workshops servicing electric buses has resulted in only one depot being used for inspection and maintenance, with electric buses handled separately from the rest of the fleet. • Beyond the legislative gaps, bureaucratic procedures for the arrival, classification, and registration permits were time-consuming, as they involved a new vehicle type and required coordination among several services.
Specific opinions on the use case:	• There is an optimism about reduced emissions, improved air quality, and enhanced passenger comfort. • Positive discussions regarding the environmental benefits and technological advancements of e-buses. • Passengers have provided feedback on delays and reliability issues, along with complaints about the current public transportation system (which can be expected to be improved with e-buses). • An expected benefit is reduced stress for bus drivers in locating a charger when the battery is low. • Passengers expect reduced stress for arriving at their destination.

PAIN	**GAIN**
1. Costs of infrastructure upgrades as well as initial costs of integration. 2. Proper training will be necessary for drivers to effectively operate electric buses (EBs). 3. The area for passengers to wait for a bus is already quite limited. 4. Limited space for additional infrastructure. 5. Bus reliability issues.	1. Integration of EB-specific line planning tools into the planning of Athens' electric bus network. 2. Reduced rostering costs for EB operations. 3. Estimation of the optimal number of electric buses required to effectively service the existing non-electric bus routes. 4. Improved passenger comfort for passengers using E-buses. E-buses are new vehicles with modern seating capabilities, able to accommodate more people with greater comfort. 5. As an indirect effect, the adoption of electric buses is expected to bring reduced traffic, decreased congestion and environmental pollution (CO_2 reduction) in the long-term.

3.1.3.2. Efficient setup of e-charging infrastructure for public transport systems (AT-UC02)

Table 6: Athens Use Case 2 – capability

AT-UC02
Optimal planning of locations of e-chargers for the Athens electric bus network

USE CASE DESCRIPTION	This Use Case focuses on evaluating the role of optimization techniques in creating an efficient framework for designing e-charging infrastructure. Athens will develop and test a **Charging Station Location Problem (CSLP) model** tailored to Athens' public transport network. This model will offer a strategic approach to seamlessly integrating electric buses into the existing system. The primary objective is to identify and plan the necessary infrastructural adaptations to support the charging process for Athens' electric bus fleet. Key considerations include determining the types of chargers (slow or fast), the number required, optimal installation locations, and the capacity of charging stations. Additionally, the framework may recommend reconfiguring bus depots and specific bus stops to ensure adequate space for installing and operating the chargers effectively. The Use Case aligns with technological advancements under WP2, employing the EB-CSLP tool to optimize charger specifications, quantities, and locations.
AREA DESCRIPTIO	Similar to AT-UC01, this UC will be implemented within the municipality of Athens, covering its historic center, central business districts, and major transportation hubs. The designated area spans 38.96 square kilometers. For a detailed description of the area, please refer to the previous Use Case (AT-UC01).

OBJECTIVES Alignment with:	**MOBILITY STRATEGIES**	**CCC**
Reduced deadheading times and operational downtimes of electric buses due to charging needs	✓	✓
Reduced installation and maintenance costs of chargers	✓	✓
Optimised number of required chargers	✓	✓
Enhance the efficiency and sustainability of Athens' public transport system as it transitions to electric mobility	✓	✓

BARRIERS

1. **Infrastructure barriers**: The installation of electric bus chargers at OSY depots necessitates significant upgrades to the electricity network. This process is both time-intensive and costly for the company, posing a substantial challenge to the implementation of electric vehicle infrastructure. However, the models will be able to propose the optimal charger locations while also considering slow and fast charging. Thus, it can propose the best set-up of chargers that can be eventually implemented by the metaCCAZE LL.
2. **Regulatory barriers**: With electromobility in Greece still in its early stages, the absence of comprehensive regulations creates challenges. There are no established standards for the safe operation of maintenance and parking facilities for electric buses. Additionally, the lack of formal training and certification programs for drivers and technicians hinders the effective organization of electric vehicle operations, leading to delays and difficulties.

PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC

EBRT2030 (2023-2026): For a detailed description this project, please refer to the previous Use Case (AT-UC01).

A study performed by a private company for OASA S.A. and OSY S.A (date n.d): OASA and OSY have performed a previous study of how to transition to electric mobility and electric bus fleets. The study was completed a few years ago by a Greek company and is currently inaccessible. However, it is known that it has been performed by practitioners who relied on traditional planning methods and domain expertise. So, in metaCCAZE insights will be gathered from what OASA already considers in their planning from previous projects, and to this the metaInnovations that will be specifically designed for two use cases of the living lab will be added. Also, it is important to note that in the transition to electric mobility the needs of OASA and Athens have changed from a few years ago and the initial planning. So innovative digital models, based on Operations Research and Artificial Intelligence are being designed, in order to consider factors such as slow and fast chargers, delays in the trip execution times and extending already existing infrastructures.

RELATED EXISTING SERVICES	BARRIERS / SOLUTIONS FROM CITY'S MOBIILITY STRATEGIES
Charging station and Electric Bus Monitoring Application: Monitor in real time the electric bus operation and charging	Barriers: Limited monitoring capabilities due to the limited number of slow chargers installed currently. Insufficient number of slow and fast chargers; charging station congestion. Inefficient charging schedules leading to energy wastage and longer downtimes. Solutions: Enhance the system with IoT-enabled chargers and integrate with OASA telematics for real-time data on bus operations and charging status. Install more charging stations in strategic locations, prioritizing high-demand areas such as depots and key transit hubs. Deploy AI-based smart charging systems to optimize schedules based on energy demand and fleet requirements.

STAKEHOLDERS LIST	
Public entities/Academia	Municipality of Athens Region of Attica Sustainable Mobility Unit (NTUA)
Private stakeholders /businesses /operators:	Road Transport S.A (OSY) * Public Transport Authority OASA* Anaplassis - State Agency * Marathon Data Systems Energy management authority (DEI) Energy grid operator (DEDIE)
Citizens groups/ associations	Athens Traders' Association Hellenic Institute of Electric Vehicles Helenic Institute of Transportation Engineers

** Stakeholders highlighted with a (*) have participated in the mini dialogue (see below)*

Mini-dialogue for Athens UC02 (AT-UC02)

For the Athens Use Case concerning Efficient setup of e-charging infrastructure for public transport systems, the mini dialogues consisted of a 1-on-1 meeting with the supervising public transport authority (OASA) and the bus services operator (OSY), as well as an additional Teams meeting with the state agency (Anaplassis) where insights were collected with the aid of a shared Miro board. The inputs collected during the discussions were elaborated using the Empathy Map methodology and are summarized in the following table.

Table 7: Athens Use Case 2 - empathy

STAKEHOLDERS' PERSPECTIVE

Identification of real needs:	• The procurement of specialized software for energy management at depots to ensure the efficient utilization of charging stations is essential. • The procurement of additional electric buses in the near future will necessitate a further network upgrade, this time by the high-voltage power provider.
Identification of early barriers/concerns:	• Insufficient charging infrastructure, congested urban areas, and current traffic issues. • Despite initial studies on depot electrification needs, OASA reports that the trial operation of the electric vehicles revealed challenges in accurately predicting electricity demands at charging locations.
Specific opinions on the use case:	• Concerned about delays in charging of e-buses. • There is concern about the reliability of e-buses, stress related to locating charging stations, and worries about the efficiency of integration.
PAIN	**GAIN**
1. Increased costs and more extensive upgrades to depot grids. 2. Installing e-bus chargers is challenging due to limited space. 3. Delays in charging. 4. Mandatory certifications and specialized training programs for technical staff to ensure readiness.	1. Decision support regarding the reduction of monetary upfront investment cost for the installation and maintenance of chargers. 2. Reduction in the total number of chargers required. 3. Reduction in deadheading times and operational downtimes of electric buses due to charting related to their charging needs. 4. A long-term benefit will be the improved performance of EB batteries and enhanced battery life maintenance. 5. Minimized daytime charging requirements through the development of optimized line plans.

3.1.4. Data map

The following table provides a comprehensive overview of the various data categories available for Athens's LL. It details the availability, description and sources relevant to the UCs. This structured approach highlights critical data points such as vehicle classifications, average speeds, commuting patterns, providing a foundation for informed decision-making and effective urban transportation planning.

Table 8: Athens's LL available data

DATA CATEGORIES	DATA VARIABLES	DESCRIPTION	AVAILABILITY	DATA SOURCE
Traffic Data	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow	Available	Google Maps
	Origin-Destination Data	Origin and destination of trips, commuter and freight traffic	Partially available	Traffic surveys, government records*

	Congestion Index	Measure of traffic congestion level, often based on travel time compared to free-flow conditions	Available	Tomtom & Google Maps
	Queue Length (Intersections / Bottlenecks)	Length of vehicle queues at intersections or bottlenecks during peak hours	Available	Google Maps
Electric Vehicle Fleet Chargers' Types and Specification	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Partially available)	OASA/OSY
	Charging Schedule and Charging Stations Occupation Rates	Schedules and occupancy rates for charging stations	Available	OASA/OSY
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Partially available for the Electric Buses	OASA/OSY
Economic Impact	Transportation Expenditures	Costs related to transportation, fuel, maintenance	Available	Minister of Development and Investments
Energy Grid Data	Transition, distribution, renewable/conventional energy mix, energy price changes	Data on energy grid infrastructure and characteristics	Available	Minister of Development and Investments
Public Transport Services	Timetables	Timetables and schedules for public transport services	Available	OASA Telematics
	Electric Vehicle Fleet Chargers' Types and Specification	Charger types and specifications for electric vehicle fleets	Available	OASA/OSY
	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Available	OASA/OSY
	Charging Schedule and Charging Stations Occupation Rates	Schedules and occupancy rates for charging stations	Available	OASA/OSY
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles	Available	OASA/OSY
	Public Transport Ticketing Data	Data related to ticketing and fare collection on public transport	Available	OASA Telematics
	Existing Origin-Destination Analyses	Analyses of existing trip origins and destinations	Partially available*	OASA Telematics
	Average Speed for Vehicles in Urban Environment	Average speed of vehicles in the urban environment	Available	Tomtom & OSM
	Road Service Status	Information on road conditions, maintenance, and construction	Available	Google Maps
	Speed Regulations for the Road Network	Legal speed limits and regulations for road traffic	Available	Department of Transport
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Partially available for	OASA/OSY

		the Electric Buses

Note:

(*) A research by OASA is being conducted considering these aspects. The modal choice is available from the SUMP of Athens 2021

For Athens' Use Cases (AT-UC01 and AT-UC02), available data includes congestion levels, queue lengths, charging station locations and schedules, public transport timetables, ticketing data, fleet specifications, and road service status, sourced mainly from OASA, Google Maps, and governmental bodies. However, critical missing data includes real-time traffic volumes, vehicle classifications, origin-destination data, air quality monitoring, ADAS adoption, intersection management strategies, and demand for on-demand mobility services, which are essential for optimizing fleet operations and planning efficient charging infrastructure.

A comprehensive overview of the data availability in all F-LLs can be found in Annex I. Further details about the characteristics of the available data of Athens can be found in Annex II.

3.1.5. Communication channels

The following table provides a mapping of the media and other communication channels necessary for the successful implementation of LLs, and for the communication and dissemination of metaCCAZE activities.

Table 9: Communication channels of the city of Athens

COMMUNICATION CHANNELS		TARGET AUDIENCE	LINK
1	OASA Webpage/ SM	*Public transport users, policymakers, and transportation professionals*	Athens Urban Transport Organization S.A. (OASA SA) | LinkedIn https://www.oasa.gr/
2	Anaplassis LinkedIn page	*Urban development stakeholders, businesses, and professionals in the sustainability sector*	Anaplassis S.A. | LinkedIn
3	getelectric.gr	*Electric vehicle users, tech enthusiasts, and sustainability advocates*	https://getelectric.gr/
4	metaforespress.gr	*Transport industry professionals, policymakers, and businesses*	https://www.metaforespress.gr/
5	Hellenic Ministry of Infrastructure and Transport	*Policymakers, infrastructure developers, and the general public*	https://www.yme.gr/
6	City of Athens	*Residents, tourists, businesses, and international partners*	https://www.cityofathens.gr/

3.2. Status Quo Map for Krakow

Krakow, with 806,201 residents, is Poland's second-largest city by population and area, covering 327 km². It is the capital of the Małopolska province and forms the core of both the Kraków agglomeration and the Kraków metropolitan Area. Its Functional Urban Area (FUA) encompasses Krakow as the metropolitan hub and 14 neighbouring communes.

Renowned for its historical and cultural significance, Krakow is a UNESCO World Heritage Site and one of the first cities included in the World Natural and Cultural Heritage list. In 2000, Krakow was honored as the "Cultural capital of Europe." The city's old town is celebrated for its unique historic character, blending cultural heritage with vibrant economic and tourism activities.

Krakow is a prominent academic center, hosting 23 universities that bolster its reputation as a leading intellectual and research hub. The city also stands as Poland's largest outsourcing hub, employing 40% of the national workforce in this sector, highlighting its economic dynamism.

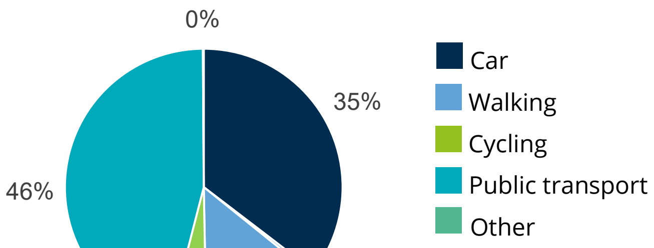
Strategically positioned as an urban node within European transport corridors, Krakow is intersected by the North sea-Baltic sea corridor and the Baltic sea-Black sea-Aegean sea corridor, underscoring its importance in trans-european logistics and connectivity. These corridors enhance Krakow's role as a vital link in the region's transport network and its capacity for international collaboration.

A FEW FACTS...

EU MISSION LABEL – CLIMATE-NEUTRAL & SMART CITIES

Krakow has already its EU MISSION LABEL

806.201 inhabitants



**Comprehensive traffic study of Krakow city and its aglomeration*

Key facts:
UNESCO world heritage site # Cultural capital # Outsourcing hub # Vision ZERO objectives # academic centre

Urban node at the intersection of two TEN-T corridors:
North Sea-Baltic Sea Corridor and the Baltic Sea-Black Sea-Aegean Sea Corridor

Sustainable mobility strategies:
- Krakow is one of the MISSION CITIES – committed to achieve climate-neutrality by 2030
- Krakow has signed the Climate City Contract in September 2024
- Its SUMP was approved in 2023 and includes targets and objectives for 2033 and 2045.

3.2.1. Sustainable mobility planning policies

On December 6, 2023, the Krakow city council passed a resolution adopting and implementing the Sustainable Urban Mobility Plan (SUMP) for the Krakow metropolis and its functional area.

This document establishes a unified framework for advancing sustainable mobility, aiming to create a transport system that is environmentally sustainable and user-friendly while fostering the balanced development of all modes. It also organizes sustainable mobility strategies for the municipalities included in the plan. The plan outlines measures to improve:

- accessibility to public transport,
- safety for all road users,
- the quality of public spaces, and
- the planning, organization, and promotion of sustainable transport.

These efforts aim to reduce emissions of harmful substances, such as particulate matter, and greenhouse gases, including CO_2, from the transport system.

Additionally, the SUMP for the Krakow metropolis and its functional area will be adopted by resolutions of commune councils across the metropolitan area. By implementing the plan, the 36 municipalities involved will collaborate to enhance sustainable and efficient mobility for residents across the region.

Geographical scope:

The SUMP for Krakow encompasses the city itself and its surrounding communes, including Biskupice, Czernichów, Igołomia-Wawrzeńczyce, Kocmyrzów-Luborzyca, Liszki, Michałowice, Mogilany, Niepołomice, Skawina, Świątniki Górne, Wieliczka, Wielka Wieś, Zabierzów, and Zielonki. This area represents the institutionalized cooperation framework within the Krakow Metropolis Association.

Beyond the association's boundaries, the SUMP also considers communes outside the Krakow Metropolis but functionally connected to the city. These areas were included by analyzing their strategic mobility connections to Krakow and its metropolitan communes, aligning with the goals of sustainable urban mobility. The Plan identifies two key areas: municipalities directly bordering Krakow, forming the core functional area, and those connected through intermediate municipalities, reflecting the broader functional network.

Timing:

Approved in 2023 towards 2033 objectives.

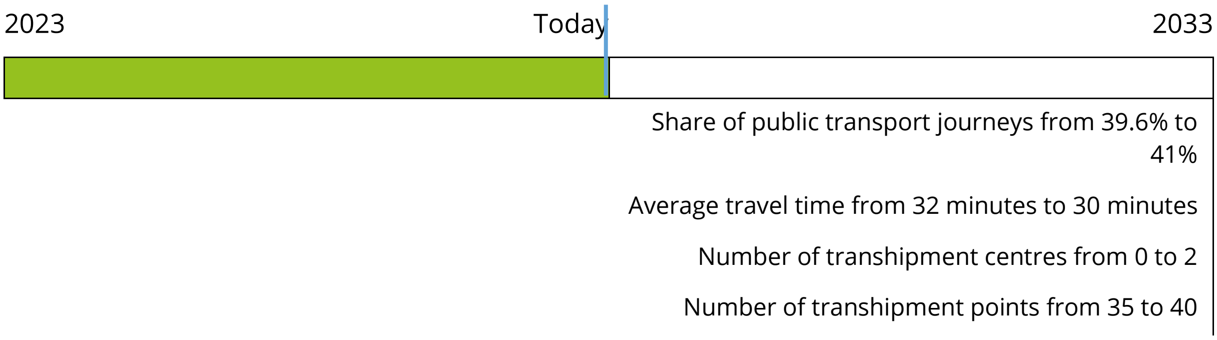


Figure 3. Sustainable mobility planning policies main targets - Krakow

Sustainable mobility monitoring schemes

Monitoring of the indicators assumes two 2.5-year cycles within the 5-year periods indicated for the update.

3.2.2. Climate City Contract policies and metaCCAZE alignment

Krakow is one of the Mission Cities and the Climate City Contract was translated into English and was signed by the President Alexander Miszalski on September 3, 2024.

The following table presents a list of the anticipated policies related to urban mobility that are included in the CCC. For each action, it is indicated whether the metaDesigned UCs will contribute (or not) to their implementation.

Table 10: Policies contained in the CCC of Krakow

POLICIES CONTAINED IN THE CCC	UC
Public Transportation Electrification ○ Project for fast, collision-free rail transport in Krakow (Premetro) ○ Focusing mainly on the development of public transport infrastructure ○ Development of the tram fleet to serve the Krakow City Transport system and development of Intelligent Transport Systems (ITS) to improve transport accessibility within the city of Krakow ○ Construction of new tram lines together with accompanying infrastructure	✗
Micro-mobility ○ Projects and activities related to the development of cycling infrastructure and implementation of the Cycling Policy of the City of Krakow ○ Promotion of alternative modes of transport such as scooters, bicycles, etc., and the development of transport infrastructure necessary for their use	✓
Urban Planning Development ○ Integrated tram infrastructure contributing to city planning	✗
Traffic and Parking Management ○ Development of Intelligent Transport Systems (ITS) to improve transport accessibility within the city of Krakow (also overlaps with public transport improvements)	✗
Freight and Logistics Development ○ Support for the establishment of logistic centres and freight consolidation points ○ Introduction of intelligent systems logistics management systems like a digital platform, tracking and route optimisation systems ○ Encouraging companies to invest in electric and hybrid vehicles through tax breaks and subsidies. ○ Establishing logistic co-operatives thereby promoting cooperation between companies and initiating partnership agreements. ○ Establish low emission zones and ban empty vehicles ○ Encouraging deliveries at night when there is less traffic, allowing vehicles to move more quickly and efficiently. Also, establishing time windows for deliveries in the city centre for better traffic management. ○ Investing in clean modes of transport of transport like electric and hybrid fleets and also promoting rail freight transport. ○ Organise training and workshops for logistics companies on sustainable transport practices.	✓

- Introduce legislation to support sustainable logistics, such as mandatory reporting of vehicle loading rates.

3.2.3. Krakow's UCs - Resources and needs

As anticipated in the introduction, Krakow proposes one Use Case that will be tested within metaCCAZE.

- KR-UC01 - Multimodal passenger hub through the physical integration and monitoring of shared e-bikes and e-cargo bikes ():

This Use Case is approached from two perspectives. On one hand, it involves a physical intervention by establishing a multimodal hub integrated with e-bikes and e-cargo bikes at the Grzegórzki SKA train station. On the other hand, it focuses on monitoring usage patterns and demand for e-bikes and e-cargo bikes in the pilot area. Since the objectives, challenges, and stakeholders involved differ, the Living Lab has decided to analyze them as two sub-Use Cases:

- *KR-UC01 - A - Multimodal passenger hub*
- *KR-UC01 - B - E-cargo bikes & e-bikes demand and monitoring*

For each sub-UC, a summary of the key takeaways of the ***capability map*** and ***empathy map*** are presented.

Building on the information collected by Krakow living lab partners and ZTP, the support partner, the following sections provide, for each sub-UC, a description of the measures to be implemented within metaCCAZE together with the preliminary barriers, existing services potentially related to each UC, and relevant projects, studies and past experiences that could be leveraged. In addition, the sections include the main outcomes of the mini dialogues hosted in Krakow between November-December.

3.2.3.1. Multimodal passenger hub (KR-UC01-A)

Table 11: Krakow Use Case 1- A – capability

KR-UC01 - A	
Multimodal logistics and passenger hub	
USE CASE DESCRIPTION	This UC focuses on creating a multi-modal hub at the inner-city railway station, featuring e-cargo bikes, e-bikes for passengers, dedicated parking systems, and the long-term LajkBike sharing system. The hub aims to streamline parcel deliveries within the city center, including restricted access areas, by implementing a cargo e-bike system with the necessary infrastructure. Additionally, it will integrate bike-sharing services into the station. On a broader scale, the initiative will assess the operational, logistical, and infrastructural requirements for establishing and managing the hub efficiently.

AREA DESCRIPTION	The proposed hub is set to be located in Kraków's Grzegórzki district, near the Grzegórzki railway station. This central location is strategically positioned with direct access to the city's public transport network. The surrounding area includes residential buildings, service establishments, and the city market, and is characterized by high pedestrian activity, making it an ideal site for a multi-modal hub. Initially, the hub was planned to be situated directly beneath the railway overpasses. However, due to challenges with the lack of development projects in this area, the location is now being shifted to a nearby site. Currently, two potential locations are being considered, both of which are owned or leased by the City. One option involves demolishing an existing building, while the other requires cooperation with a commercial facility leasing the space.

OBJECTIVES Alignment with:	**SUMP**	**CCC**
Improving the efficiency of freight transport	✓	✓
Increasing the attractiveness of efficient mobility in everyday travel	✓	✓
Improving operational, logistical, and infrastructural aspects required to establish the hub effectively.	✓	✓

BARRIERS

1. **Location and infrastructure**: One potential challenge in implementing the hub is related to the technical infrastructure required for its opening. Initially, the hub was planned to be located beneath the railway flyovers at the SKA Grzegórzki railway stop. However, due to formal and technical issues, the construction of a bicycle lane and access road for delivery vans could not proceed as part of the railway investment. As a result, the decision was made to move the hub to a nearby site with enough space to locate the required infrastructure
2. **Tender for cargo bikes**: A potential obstacle in implementing the hub could arise during the tendering process for purchasing the cargo bikes, which could potentially cause delays.
3. **Construction permit**: The hub requires containerized buildings, and obtaining the necessary building permits could be problematic. A potential issue is that the building permit office may have specific requirements regarding the design of the hub that could affect its construction timeline.

PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC

Low Carb (2017–2020): In 2019, the public transport authority in Krakow, has launched a hub for reloading goods from a delivery van to a cargo bike. The pilot implementation consisted of the designation of reloading stations consisting of parking spaces for vans of 10m x 2.5m (2m) designed exclusively for the system users and parking spaces for freight bikes of 2m x 2.5m secured by flexible posts. The Covid pandemic negatively affected the operation of the point. The pilot focused at the organization of reloading points from a delivery van to a cargo bike, in which suppliers were reloading goods on dedicated bikes in order to deliver them to service outlets - shops, local and gastronomic services in the old town - Kazimierz.

RELATED EXISTING SERVICES	**BARRIERS / SOLUTIONS FROM CITY'S MOBIILITY STRATEGIES**

Park+Ride Czerwone Maki	In 2020, Krakow's public transport authority launched a free pilot electric bicycle rental service, Park-e-Bike, at the Czerwone Maki Park+Ride as part of the Interreg Central Europe project "Low Carb". Initially, 43 e-bikes were available, and in 2022, the system expanded with 100 additional bikes and three new stations at Park+Ride locations in Nowy Bieżanów, Kurdwanów, and Mały Płaszów were established. Rentals are available only at Park-e-Bike stations, but users can park bikes at any accessible point in Krakow and Skawina. The service operates on weekdays from 6 a.m. to 9 p.m., with rentals until 8 p.m., and is free for users. Barriers: As the system was free of charge, serious problems with vandalism arose in 2022 after the system was expanded to include 3 new stations. Another barrier is that the system does not verify how many people using Park-e-Bike rentals have previously left their cars in the 'Park and Ride' car park. Solutions: A solution to combat the vandalism problem was to introduce an additional verification stage into the system. This significantly reduced such acts.
Reloading goods service as a part of the Low Carb project	In 2019, the public transport authority in Krakow, has launched a hub for reloading goods from a delivery van to a cargo bike. The pilot implementation consisted of the designation of reloading stations consisting of parking spaces for vans of 10m x 2.5m (2m) designed exclusively for the system users and parking spaces for freight bikes of 2m x 2.5m secured by flexible posts. Parking was permitted only during loading and unloading of goods and renting a freight bicycle was for upto 60 minutes. The Covid pandemic negatively affected the operation of the point. The pilot focused at the organization of reloading points from a delivery van to a cargo bike, in which suppliers were reloading goods on dedicated bikes in order to deliver them to service outlets - shops, local and gastronomic services in the old Town - Kazimierz.t Barriers: During the project, plans to establish two hubs were scaled back due to the traffic department's approval of only one location. Challenges arose with parking spaces designated for delivery vehicles at the Cargo Velo point, as they were frequently used by unauthorized users. The Covid-19 pandemic further impacted the project, preventing many stakeholders from testing the solution due to restrictions that halted restaurant operations. Additionally, changes to traffic management on Ogrodowa street, including the extension of a bus stop, led to the removal of the Cargo Velo point in 2022. Currently, bicycles can be rented through the ZTP bike service. Solutions: Even if this happened mainly due to COVID, a strategy to avoid this barrier will be integrated when de-designing the UCs.

STAKEHOLDERS LIST	
Public entities/Academia	Department of Entrepreneurship and Innovation, Municipality of Krakow*
	Centre for Investor Support and the Innovative Economy, Municipality of Krakow*
Private stakeholders/ businesses/	INPOST – Logistics Company*
	DPD - Dynamic Parcel Distribution*

operators	
Citizens groups/associations	Stowarzyszenie Kraków Miastem Rowerów

** Stakeholders highlighted with a (*) have participated in the mini dialogue (see below)*

Mini-dialogue for Krakow UC01 part A (KR-UC01-A)

For the Kraków multimodal hub use case, mini-dialogues were organized as meetings with the stakeholders who provided valuable insights to understand how the use case could be successfully integrated into the Living Lab. Participants in the mini-dialogue sessions included two departments of the Municipality of Krakow who would help support the development of and provide space for the new hub, along with two logistics companies (INPOST, DPD) which would use the hub as a space to operate using their e-cargo bike services. The logistics companies would provide their own micromobility devices and potentially a container for the hub. The mini dialogue was aimed at discussing and specifying the needs of stakeholders relevant to the local use case to understand their actual needs, identify challenges or barriers and get their feedback and opinions. The meeting with DPD took place on the 9th of June, while the meeting with The Department of Entrepreneurship and Innovation and InPost was held on the 15th of November. The data collected during these discussions was compiled using the Empathy Map methodology and summarized below.

Table 12: Krakow Use Case 1-A - empathy

	STAKEHOLDER PERSPECTIVE
Identification of real needs:	• Private companies require space in the area that will enable them to operate using cargo e-bikes within the Old Town and Kazimierz districts. These companies are interested in collaborating with the Municipality. • Each company requires its own secure space, as shared usage is not feasible. They intend to operate with their own cargo e-bikes, specifically designed to meet their individual needs. • One of the private companies also has an initiative to establish a city hub. The company is seeking a location to set up this hub. The hub, organized as part of the MetaCCAZE project, aligns with the company's own plans. The company is willing to provide its own container at the site where the hub can be established.
Identification of early barriers/concerns:	• The area designated for the point is under conservation protection, which necessitates approval regarding the form and appearance of the point. • The requirement for approvals from multiple institutions may present challenges regarding the timeline for the point's opening.
Specific opinions on the use case:	• The location should also ensure minimal inconvenience to residents. • According to parcel distribution companies, the location of the point should be situated in a way that is not visible to the public. The infrastructure must be capable of accommodating vehicles suitable for transporting parcels stored in specialized cages.

PAIN	GAIN
1. The creation of necessary infrastructure is required with formal approvals.	1. The Potential to Serve the City's Inner Area, particularly with the planned introduction of Low Emission Zone. 2. Increasing the Attractiveness of the Local Market Located Near the Planned Hub

3.2.3.2. E-cargo bikes & e-bikes demand and monitoring (KR-UC01 - B)

Table 13: Krakow Use Case 2 - capability

KR-UC01 – B			
E-cargo bikes & e-bikes demand and monitoring			
USE CASE DESCRIPTION	This sub-UC focuses on monitoring the usage patterns and demand for cargo and e-bikes at a hub near the Grzegórzki SKA train station in Krakow. The public transport authority of Krakow, supported by Mobilysis (a company providing mobility solutions as an all-in-one service based on drone data) , will collect and analyze data using a drone swarm. This innovative approach will assess bicycle demand and usage within the railway stop's vicinity, including its surrounding infrastructure, to optimize hub operations and support sustainable mobility initiatives.		
AREA DESCRIPTION	The area under analysis encompasses the location of the proposed multimodal hub (KR-UC01-A near the Grzegórzki SKA train stop. The analysis covers the vicinity defined by the streets Starowiślna, Dietla, Grzegórzecka, Al. Daszyńskiego, and Miodowa. This area lies on the border between two Krakow districts: District I, Stare Miasto (Old Town), and District II, Grzegórzki.		
OBJECTIVES	Alignment with:	**SUMP**	**CCC**
Data - traffic measurements, research and the use of data in consultation and decision-making processes		✓	✓
BARRIERS			
Launching challenges - Any problem with the organisation of the hub may cause a problem with monitoring the functionality of the centre.			
PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC			
Please refer to the previous sub-Use Case (KR-UC01-A).			
RELATED EXISTING SERVICES			
Please refer to the previous sub-Use Case (KR-UC01-A).			
STAKEHOLDERS PARTICIPATING IN MINI-DIALOGUES			
Public entities/Academia	Department of Public Utilities and Climate (Transport Analysis Department) Municipality of Krakow		
	The Department of Municipal Management and Climate, Municipality of Krakow*		

Private stakeholders/ businesses/ operators:	Mobilysis Amreco (counter system distributor)* Eco-Counter (manufacturer of innovative counting solutions) *

** Stakeholders highlighted with a (*) have participated in the mini dialogue (see below)*

Mini-dialogue for Krakow UC01 part B (KR-UC01 - B)

For the Kraków Use Case of E-cargo bikes & E-bikes demand and monitoring, mini-dialogues were organized as meetings with the stakeholders, who provided valuable insights to understand how the use case could be successfully integrated into the Living Lab. The mini dialogue was aimed at discussing and specifying the needs of stakeholders relevant to the local use case to understand their actual needs, identify challenges or barriers and get their feedback and opinions. The stakeholders involved in the meetings included The Department of Municipal Management and Climate (Municipality of Krakow) which would help organize the data collection and monitoring of e-bike and e-cargo bike traffic, as well as Amreco – the only distributor of French company Eco-Counter (manufacturer of unique and innovative solutions to count pedestrians and cyclists) - which would supply the monitoring equipment. The meeting with Amreco and Eco-Counter was held on 18th of November, while the meeting with The Department of Municipal Management and Climate took place on the 28th of November. The data collected during these discussions was compiled using the Empathy Map methodology and summarized in the table below.

Table 14: Krakow Use Case 1-B - empathy

	STAKEHOLDER PERSPECTIVE
Identification of real needs:	• In Kraków, there are 17 automatic counters provided by the Amreco company, which enable the monitoring of changes in cyclist traffic over time. However, this system does not have the capability to count cargo bikes as a separate category of vehicles.
Identification of early barriers/concerns:	• The city is not experienced in operating e-cargo bikes especially for city center operations. • Cargo bikes have not been classified as a separate group, as this type of bicycle remains relatively unpopular in both the city and Poland in general. There are concerns regarding the limited visibility and the purpose of measuring cargo bikes in the area of the planned transshipment point.
Specific opinions on the use case:	• The question arises whether it would be possible to expand the scope of measurement to include monitoring events related to road traffic safety, such as near-miss accidents. • Although there is no formal definition of cargo bikes, their design allows them to be distinguished from other types of bicycles. This makes it possible to study the traffic volume of these vehicles.

PAIN	**GAIN**
1. There are concerns regarding the technical limitations of drones, particularly the restricted visibility within the area where the multimodal hub is planned, due to the presence of railway viaducts. The study will	1. Measuring traffic using swarms of drones is an innovative method that has not yet been used by the Municipality of Kraków. This approach presents

have to comply with Polish law regarding the use of drones, as well as with GDPR. 2. The primary focus should be on improving safety, and the method should be applied at major intersections, rather than solely near the area where the multimodal hub is planned to be established.	an opportunity to gather new types of data regarding the traffic of cargo bikes.

3.2.4. Data map

The following table provides a detailed overview of the various data categories, variables, and descriptions relevant to traffic and transportation analysis for Krakow. It includes the availability of these data types and their respective data sources, offering a comprehensive foundation for urban transportation planning and analysis. The table encompasses key areas such as traffic data, and hubs.

Table 15: Krakow's LL available data

DATA CATEGORIES	DATA VARIABLES	DESCRIPTION	AVAILABILITY	DATA SOURCE
	Average Daily Traffic (ADT)	Number of vehicles passing through a specific location on a road or highway within a day	Limited availability	Traffic counters, sensors
	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow	Limited availability	Traffic counters, sensors
	Origin-Destination Data	Origin and destination of trips, commuter and freight traffic	Limited availability	Traffic surveys, government records
	Traffic Volume	Number of vehicles passing through a specific point or section of road within a given time frame	Limited availability	Traffic counters, sensors
Traffic KPIs	Traffic Density	Measure of vehicle concentration per unit length of road	Limited availability	Traffic counters, sensors
	Average Speed	Mean speed of vehicles along a road segment or corridor	Limited availability	Traffic modeling data
	Free Flow Speed	Speed vehicles would travel at under ideal conditions, unaffected by congestion	Limited availability	Traffic modeling data
	Congestion Index	Measure of traffic congestion level, often based on travel time compared to free-flow conditions	Limited availability	Traffic modeling data
	Queue Length (Intersections / Bottlenecks)	Length of vehicle queues at intersections or bottlenecks during peak hours	Limited availability	Traffic modeling data

	Peak Hour Traffic	Traffic volume and flow patterns during peak hours of the day	Limited availability	Traffic modeling data
Transport Network	Road Network Characteristics	Lane widths, speed limits, classifications	Publicly available/ Limited availability	Traffic management agencies
	Bicycle and Pedestrian Infrastructure	Availability of bike lanes, sidewalks, crosswalks	Publicly available	Department of Transport website Traffic management agencies
Electric Vehicle Fleet Chargers' Types and Specification	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Publicly available	EV charging network databases
	Weather Data	Meteorological data including temperature, precipitation, etc.	Publicly available	Meteorological agencies
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Limited availability for P+R parking	Department of Transport website Traffic management agencies
Intersection Management	Intersection Management	Management strategies and data for traffic intersections	Limited availability	Traffic organization designs for roads
Environmental Impact	Air Quality Monitoring Data	Pollutant concentrations, emissions	Publicly available	Environmental monitoring agencies
Energy Grid Data	Transition, distribution, renewable/conventional energy mix, energy price changes	Data on energy grid infrastructure and characteristics	Publicly available	State-owned company that manages the National Electricity System
Public Transport Services	Timetables	Timetables and schedules for public transport services	Publicly available	Department of Transport website
	Electric Vehicle Fleet Chargers' Types and Specification	Charger types and specifications for electric vehicle fleets	Limited availability	Transport department records
	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Limited availability	Transport department records
	Charging Schedule and Charging Stations Occupation Rates	Schedules and occupancy rates for charging stations	Limited availability	Transport department records
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles	Limited availability	Transport department records

Weather Data	Weather Data	Meteorological data including temperature, precipitation, etc.	Publicly available	Meteorological agencies
Management	Road Service Status	Information on road conditions, maintenance, and construction	Limited availability	Traffic management agencies
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Limited availability for P+R parking	Department of Transport website
	Intersection Management	Management strategies and data for traffic intersections	Limited availability	Traffic organization designs for roads
	Curbside Information for the Urban Environment	GIS data related to curbside management in urban areas	Publicly available	Online mapping services
	Demand for On-demand Mobility Services	Data on demand for on-demand mobility services	Limited availability	Transport department records
Hub	Delivered parcels by Logistic Hub/day	Total number of parcels to be delivered via the planned hub per day	data that is planned to be collected	
	Number of active bicycles in the hub	Number of active bicycles in the hub	data that is planned to be collected	
	Percentage of area's population served by hub	Percentage of area's population served by hub	data that is planned to be collected	

For Krakow's Use Cases (KR-UC01-A & KR-UC01-B), available data includes bicycle and pedestrian infrastructure, EV charger locations, air quality monitoring, energy grid data, public transport timetables, and curbside management information, primarily sourced from government agencies and environmental monitoring bodies. However, key missing data necessary for optimizing the multimodal passenger hub and e-bike demand monitoring includes real-time traffic and congestion metrics, vehicle classifications, origin-destination analyses, parking availability beyond P+R lots, charging station occupancy rates, which are essential for effective multimodal planning and assessing demand for shared micromobility services.

A comprehensive overview of the data availability in all F-LLs can be found in Annex I. Further details about the characteristics of the available data of Athens can be found in Annex II.

3.2.5. Communication channels

The following table provides a mapping of the media and other communication channels necessary for the successful implementation of LLs, and for the communication and dissemination of metaCCAZE activities.

Table 16: Communication channels of the city of Krakow

N°	COMMUNICATION CHANNELS	TARGET AUDIENCE	LINK
1.	Facebook (ZTP, official)	*Adults, primarily residents of Krakow, including business owners and internet users aged, 25-60.*	https://www.facebook.com/ZTPkrakow
2.	Instagram (ZTP, official)	*Adults, primarily residents of Krakow, including business owners and internet users aged, 25-60.*	https://www.instagram.com/ZTPkrakow
3.	Website (ZTP official)	*Adults, primarily residents of Krakow, including business owners and internet users aged, 35-60.*	https://ztp.krakow.pl/
4.	Website (city, official)	*Adults, primarily residents of Krakow, including business owners and internet users aged, 35-60.*	https://www.krakow.pl/aktualnosci/279171,26,komunikat,rowery_cargo_i_wezel_przeladunkowy_w_ramach_nowego_unijnego_projektu.html
6.	LinkedIn (non-official)	*Adults, primarily residents of Krakow, including business owners and internet users aged 25-60.*	https://www.linkedin.com/in/maciej-sergiusz-piotrkowski-5348b920a/
5.	Local broadcast stations (i.e. Eska, Meloradio, Radio Kraków	*Adults, primarily residents of Krakow, including business owners and internet users aged 18-50.*	https://krakow.eska.pl/; radiokrakow.pl, meloradio.pl,
6.	Newspapers (Rzeczpospolita, Gazeta Wyborcza, Dziennik Polski, Gazeta Krakowska...)	*Adults, primarily residents of Krakow, including business owners, aged 45-70.*	https://krakow.wyborcza.pl/krakow/7,44425,30660807,rowerowe-serce-krakowa-powstanie-w-rejonie-hali-targowej.html www.rp.pl https://dziennikpolski24.pl/ https://gazetakrakowska.pl/
7.	News portals	*Adults, primarily residents of Krakow, including business owners and internet users, aged 25-60.*	https://ikc.pl/ https://krakow.naszemiasto.pl/ https://smoglab.pl/ https://krknews.pl/ https://www.malopolskainfo.pl/ https://lubie.krakow.pl/ https://biznesistyl.pl/
8.	Local TV station (TVP Kraków)	*Adults, primarily residents of Krakow, including business owners, aged 35-70.*	https://krakow.tvp.pl/
9.	Technical portals	*Adults, primarily residents of Krakow, including business owners, aged 35-70.*	*https://www.transport-publiczny.pl/*

3.3. Status Quo Map for Gozo-Malta

Malta comprises three main islands: Malta, Gozo, and Comino (which is uninhabited). The archipelago, covering just 316 square kilometres, faces the challenge of a growing and dense population. Gozo, with its rural charm, is renowned for its rolling hills, cultural landmarks, beaches, and diving spots, making it a favourite destination for both tourists and locals.

As part of Malta's broader climate strategy, Gozo has committed to achieving climate neutrality and is one of the 100 cities participating in the European Union's Climate-Neutral and Smart Cities Mission. Its Climate City Contract is in development.

The EcoGozo initiative supports this goal by promoting sustainable development across the pillars of economy, environment, society, and cultural identity. This has included major projects in water conservation, renewable energy, biodiversity, and sustainable agriculture, implemented in collaboration with various stakeholders.

A recent project involves piloting automated on-demand e-bus services in various contexts across Malta and Gozo, demonstrating innovative solutions for sustainable and efficient transport.

A FEW FACTS ABOUT MALTA AND GOZO...

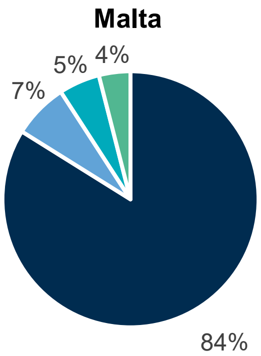
Gozo is one of the MISSION CITIES, and the Climate City Contract is in development

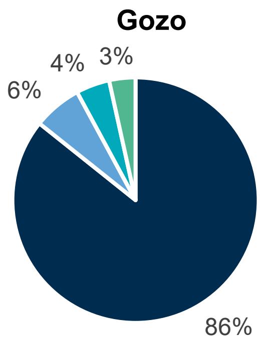
Malta

542.051 inhabitants

Gozo

39287 inhabitants





Car
Walking
Cycling
Public transport
Other (motorbike, e-scoote)

** NSO Household Travel Survey 2021 for Gozo & (Malta)*

Key facts:

#island #EUmissions #beaches #Touristic city #International Port #Cultural hub

TEN-T Comprehensive network:

Valetta (Malta is an urban node. Cirkewwa (Malta) and Mgarr (Gozo) are maritime ports (comprehensive).

Sustainable mobility goals:

- Gozo is one of the MISSION CITIES – committed to achieving climate-neutrality by 2030
- Its Climate City Contract is in development
- While Malta does not have a Sustainable Urban Mobility Plan (SUMP), it follows a similar strategic framework—the Transport Master Plan, approved in 2016. This plan outlines key targets and objectives for 2025 and 2030.

3.3.1. Sustainable mobility planning policies

The Transport Master Plan 2025 for Malta outlines the country's strategy for improving its transport systems over the next decade, supporting the goals of the National Transport Strategy 2050. The plan seeks to create a safer, more efficient, and sustainable transport network across air, sea, and land transport sectors. It starts with an extensive analysis of current transport challenges in areas such as road infrastructure, public transport, maritime, and air sectors. The plan establishes operational objectives for each transport mode, identifies key projects for investment, and prioritizes capital measures for the short term.

The plan also includes a policy scenario testing process, which simulates two alternative futures to assess the potential impact of various transport measures. Environmental factors are closely considered, and sustainability is integrated throughout the strategy.

Overall, the Transport Master Plan 2025 aims to guide the development of a transport system that contributes to Malta's long-term strategic goals, balancing economic growth, environmental sustainability, and improved mobility for citizens and visitors. The principles guiding this Master Plan:

- Efficient utilisation of the existing transport system - Traffic management, Logistics planning and enforcement
- Creating modal shift
- Integrated approach to planning and design
- Encouraging use of greener fuels and vehicles
- Modernisation, development and revitalisation of the strategic transport network to improve territorial cohesion
- Investment in education, information and human resources
- Making room for innovation and research
- Sustainable financing and Fair competition

Geographical scope:

The Transport Master Plan, 2025 covers all relevant transport modes (land, public transport, sea and air) for the short, medium and long-term objectives for the islands of Malta and Gozo. This was developed with the National Transport Strategy, 2050.

Timing:

Transport Master Plan approved in 2016 towards short term objectives in 2025 and mid-term objectives within 2030 objectives. It is a planning and implementation document, with measures in the short to medium term (10 years) in duration.

2016 Today	2025 2030
Increase Bus Average Speed at AM Peak to 17.5km/h	*Increase Bus Average Speed at AM Peak to 20.5km/h*
Increase zero emission urban logistics to 50%	*Increase zero emission urban logistics to 95%*
Reduce non-ETS Greenhouse gas emissions to 527 ktCO2 equiv	*Reduce non-ETS Greenhouse gas emissions to 525 ktCO2 equiv*
Increase public transport boardings to 47.0m	*Increase public transport boardings to 50.2m*
Decrease percentage of population that are >15min on foot from nearest bus stop to 3.4%	*Decrease percentage of population that are >15min on foot from nearest bus stop to 3%*
Reduce road accident fatalities to 9	*Reduce road accident fatalities to 8*
Reduce percentage of conventionally fuelled cars to 80%	*Reduce percentage of conventionally fuelled cars to 50%*
Reduce modal share of car to 47%	*Reduce modal share of car 41%*
Increase modal share of on-motorised trips to 11%	*Increase modal share of on-motorised trips to 15%*

Figure 4. Transport Master Plan main targets – Gozo & Malta

Transport Master Plan monitoring:

The plan includes a detailed monitoring system to track progress toward its goals, with clear indicators to assess the economic, social, and environmental impacts of the plan's implementation. However, it has not yet been pursued.

3.3.2. Climate City Contract policies and metaCCAZE alignment

The Climate City Contract is still under development.

3.3.3. Gozo-Malta's UCs - Resources and needs

As anticipated in the introduction, Gozo-Malta proposes a single Use Case that will be tested within metaCCAZE. For each UC, a summary of the key takeaways of the ***capability map*** and ***empathy map*** are presented.

Building on the information collected by the Gozo-Malta Living Lab partners and University of Malta, the Support Partner, the following sections provide a description of the measures to be implemented within metaCCAZE together with the preliminary barriers, existing services potentially related to the UC, and relevant projects, studies and past experiences that could be leveraged. In addition, the sections include the main outcomes of the mini dialogues hosted in Gozo & Malta during November 2024.

3.3.3.1. On-demand automated mini-bus services (GM-UC01)

Table 17: Gozo-Malta Use Case 1 – capability

GM-UC01			
On-demand mini-buses services			
USE CASE DESCRIPTION	The project will showcase an innovative automated e-bus service designed to provide zero-emission mobility for residents and tourists on the islands of Malta and Gozo. This on-demand service will adapt to passenger needs and pilot Malta's first automated public transport vehicle. Through co-creation activities (metaDesign) and stakeholder engagement, the project will address key challenges such as regulatory requirements, operational parameters, and the implementation of monitoring and booking technologies. During the 8-month demonstration, the service will gather feedback from residents and tourists via surveys, focusing on their expectations, experiences, satisfaction, accessibility, and suggestions for improvement. The insights from real-world operations will help evaluate the system's scalability, reliability, and integration with existing infrastructure. The project aims to refine the service to tackle specific mobility challenges while promoting sustainable, zero-emission transport solutions.		
AREA DESCRIPTION	This use case will be implemented on the island of Gozo, targeting both tourists and local residents, and in Malta to address specific user needs, such as providing mobility for students, visitors to particular destinations, and residents accessing local services. The specific routes will be finalized during the initial phases of the pilot, once the automated bus has undergone testing and training.		
OBJECTIVE	Alignment with:	**TMP**	**CCC**
Demonstrate on-demand automated e-bus service across several routes to understand how this new service can be designed effectively and attract new users.		*yes*	*n/a*
Understand the feasibility associated with co-designed smart systems and services for user-centred, shared zero-emission mobility.		*Yes*	*n/a*
BARRIERS			
1. **Infrastructure upgrades:** Deploying an autonomous bus will necessitate significant modifications to road infrastructure, such as the installation of smart traffic signals, enhanced sensor systems, and possibly dedicated lanes to ensure smooth integration with the existing transportation network. 2. **Public acceptance:** The introduction of an autonomous e-bus in Malta and Gozo may lead to public concerns about safety, privacy, and its impact on public transport jobs. Effectively addressing these concerns and building trust among users will be key to the successful adoption of this initiative. 3. **Legal and insurance frameworks:** The absence of legislation and insurance policies specific to autonomous vehicles in Malta presents a major challenge. Clear legal frameworks and necessary permissions to operate autonomous buses on public roads must be established before implementation.			
PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC			

Project MISAM (REP-2020-017): This research project focuses on analysing the anticipated effects of shared autonomous vehicles (SAVs) on both physical and digital road infrastructures while evaluating the current infrastructure readiness at a local level. The initiative aims to introduce a sustainable and technologically advanced mobility solution in Malta, providing users with greater transport alternatives. Consultations and meetings with local stakeholders have revealed that Malta is in the early planning stages for adopting autonomous vehicles. Immediate upgrades to the nation's physical and digital infrastructure are necessary to facilitate field testing of shared autonomous mobility solutions.

The project looked at the legal and governance framework and the identification of standards and regulations for the testing and operation of autonomous vehicles. Key deliverables include a comprehensive roadmap and recommendations for local authorities, laying the groundwork for Malta's first shared autonomous shuttle pilot project on public roads.

RELATED EXISTING SERVICES	BARRIERS / SOLUTIONS FROM CITY'S MOBILITY STRATEGIES
Electric bus charging depot	An electric bus charging depot and 33 brand new, fully electric, zero-emission buses were seamlessly integrated into the bus fleet committing to provide a greener, more efficient, and customer-centric transport system for the community. Barriers: Range Limitations: Electric buses have a shorter operational range compared to diesel buses, often necessitating midday charging to complete assigned routes. This adds complexity to route planning and scheduling. Charging Time: Recharging electric buses takes significantly longer than refuelling conventional buses, potentially causing downtime and reducing overall fleet efficiency if not managed effectively. Infrastructure Requirements: The adoption of electric buses demands extensive investment in charging infrastructure. This includes setting up charging stations and possibly upgrading roads and facilities to accommodate the electrical capacity required for a fully operational electric fleet. Solutions: n/a
Tallinja on demand	Tallinja On Demand is a flexible public transport service operated by Malta Public Transport. Using advanced algorithms, the service dynamically matches passengers' pick-up and drop-off requests to create the most efficient routes. This on-demand solution offers greater flexibility and comfort, providing added value by saving time for passengers. Barriers: *Balancing vehicle supply with demand:* Insufficient vehicles can result in unmet demand, while an excess of vehicles may lead to inefficiency and resource wastage. *Service unavailability:* High demand or lack of available buses can prevent passengers from booking a ride, potentially causing them to seek alternative modes of transport. *Dependence on software:* The service relies on technology, so any software or app malfunctions—such as bugs or optimization issues—could lead to delays or missed pickups. *Route efficiency:* While on-demand services strive for optimized routes, frequent diversions to pick up multiple passengers can extend travel times, diminishing overall service efficiency.

	Solutions: n/a
Multi-modal hub (Ta' Xhajma, Gozo)	A multi-modal hub is being constructed at Ta Xhajma in Gozo, which will provide 300 parking spaces and charging pillars for electric cars. This initiative not only addresses the shortage of parking spaces in Mgarr harbour, but also promotes greener and cleaner modes of transport as part of the EcoGozo vision. The electric buses have already been in operation since 2021 from the Heliport area, but the new multi-modal hub facility will provide a more streamlined solution with free parking and shuttle service. Barriers: The Hub is still under construction and no barriers have been identified. Solutions: n/a
Electric car charging points	There are 372 charging points scattered across Malta and Gozo, with 310 in Malta across 60 localities and 62 in Gozo across 14 localities. The aim is to bolster accessibility and convenience for electric car owners and a commitment to accelerate the transition to electric mobility. Barriers: The barriers are not known Solutions: n/a
Electric last-mile delivery service (MaltaPost)	Malta's leading postal services (MaltaPost) and logistics company implemented the 'One Delivery' project which integrates four-wheeled electric cargo vehicles for letter and parcel deliveries in the Southeastern and Southern Harbour districts. This has led to the elimination of 17 delivery vans and 40 motorbikes from Malta's road network, along with a 76.6 tonne annual decrease in CO2 emissions. Barriers: Currently restricted to only one company for postal services and logistics. Solutions: Conduct studies on the potential to use smaller green freight vehicles and cargo / e-cargo bikes for ´last mile´ urban logistics. Develop an action plan for the management and regulation of freight transport and 'last mile' urban logistics
Tallinja bike service	The Tallinja Bike service in Malta is a bike-sharing system by Malta Public Transport aimed at promoting sustainable transport. Users can rent bikes from designated stations in urban areas using their Tallinja Card or app and return them to any station after short trips. The service encourages reduced car dependency and traffic congestion while promoting a healthier, eco-friendly way to travel around Malta. Barriers: *Limited coverage:* Key areas like Valletta and Sliema are served, but many rural regions lack bike stations, reducing usability. Stations can also become overcrowded during peak times. *Safety and infrastructure:* Malta's roads often lack dedicated cycling lanes, forcing cyclists to share roads with cars, which raises safety concerns. *Weather and terrain:* The hot climate can make cycling uncomfortable, and hilly areas pose challenges for casual riders without electric assistance. *Cultural factors:* A historically low cycling culture leads many locals to prefer cars, and issues with vandalism and theft impact bike availability and quality. Solutions: n/a

STAKEHOLDERS LIST	
Public entities/Academia	Transport Malta*
	Local Councils *
	Regional Councils*
	Academics (e.g. transport, urban design, sustainable development and Artificial Intelligence-AI)*
	University of Malta*
	Ministry for Health and Active Ageing
	Ministry for Education, Sport, Youth, Research and Innovation
	Ministry for Transport, Infrastructure and Public Works*
	Energy and Water Agency
	Environment and Resources Authority: ERA*
	Planning Authority
	Gozo Regional Development Authority: GRDA*
	Malta Tourism Authority
	Infrastructure Malta
Private stakeholders /businesses/ operators	Malta Public Transport*
	Electric charging Infrastructure operators
	Insurance Companies*
	Architecture & Civil Engineering Firms*
	Malta Communications Authority (5G Network)
	Businesses (Craft village, hotels...)
Citizens groups/ associations	Project Aegle Foundation
	Gozo Tourism Association*
	Rota*
	Local organisations/ groups (band clubs, scouts, girl guides etc...)
	The Malta Insurance Association
	Friends of the Earth*

** Stakeholders highlighted with a (*) have participated in the mini dialogue (see below)*

Mini-dialogue for Gozo-Malta UC01 (GM-UC01)

Two in-person, interactive workshops were held to conduct the mini-dialogue activities in Malta & Gozo. On the 11th of November the first workshop was held in the Citadel, Gozo and on the 13th of November the second workshop was held in Dingli (*Ħad-Dingli in Maltese)*, Malta.

The mini dialogues aimed at discussing and specifying the needs of stakeholders relevant to the local use case to understand their actual needs, identify challenges or barriers and get their feedback and opinions. After identifying the potential stakeholders, invitations were sent to attend the workshop. The resulting mini-dialogues involved representatives from government bodies overseeing transport (Transport Malta), private transport operators (Malta Public Transport), local and regional councils, academic institutions (University of Malta), regulatory entities (ERA), authorities responsible for development and infrastructure (GRDA, Ministry for Transport, Infrastructure and Public Works), insurance companies, infrastructure planning firms (Architecture & Civil Engineering Firms), and finally, representatives from local groups impacted by the project, such as the Gozo Tourism Association, a bicycle advocacy group (Rota), and an environmental activist group (Friends of the Earth). By incorporating a wide range of perspectives, this collaborative approach ensured a thorough examination of the potential impacts and logistical considerations of the project from multiple angles.

Figure 5. the metaCCAZE event for the Gozo/Malta "On-demand mini-buses service" use case

The results of the event were elaborated using the Empathy Map methodology and are summarized in the following table.

Table 18: Gozo-Malta Use Case 1 - empathy

STAKEHOLDERS' PERSPECTIVE	
Identification of real needs:	• With careful route selection and proper operation by drivers and technical staff, only small adjustments are required for the efficient rescheduling and operation of electric buses. • Low emission vehicles for last mile trips and 100% renewable energy transport solutions. • Mobility solutions must fit the local context especially within the old urban cores. • User-centric mobility pilots (for the elderly, children or people with mobility impairments). • Disincentivize car use and tackle traffic congestion in urban areas • Improvement in public transport services and public transport infrastructure (dedicated bus lanes, tram, train, BRT). • Transport service to particular locations which are currently hard to access with public transport. • Park and ride facilities.
Identification of early barriers/concerns:	• Concerns about practical implementation challenges such as infrastructural requirements, route choices, topography and gradient, lack of enforcement, illegal parking of other vehicles.

	• Concerns over the practicality of the service including potential disruptions for public transport services, other road users, and competition with current public transport service. • Concerns over how the bus will be advertised and reactions from the public (cultural barriers, fear of failure, lack of human contact with no driver, negative public sentiment due to not addressing more pressing local transport issues). • Concern over its applicability on a larger scale.
Specific opinions on the use case:	• Concerns over actual and perceived safety, including how the bus manages ad-hoc decision making and navigating irregularities (going the wrong way, overtaking a double-parked car, accidents). • Concerns over the autonomous vehicle specifications (size of vehicle, range, speed, batteries, charging availability). • Fears over vandalism of autonomous bus. • Concerns over not being charged using clean energy but rather the national grid.

PAIN	GAIN
1. Vehicle specifications (speed, size, range, charging). 2. The effects of the autonomous bus will not have large effects on the mobility of the islands and may cause more traffic issues or disruptions. 3. Current infrastructure may not be suitable. 4. Service would need to be highly efficient to convince people to use it. 5. More pressing urban mobility issues may cause people to look at the initiative in a negative light. 6. Negative perceptions from the community may lead to poor usage and non-representative pilot of actual potential.	1. Improved accessibility to destinations in rural/urban areas; larger areas served by PT. 2. Sustainable, clean last-mile solution (if 100% renewable energy is used to charge). 3. Makes public transport more attractive. 4. Boost for businesses and tourism. 5. May offer the opportunity to improve local enforcement, and sets an example of low-speed limits in residential areas. 6. Autonomous (no driver needed). 7. Improved accessibility for different population groups (children, elderly, people with mobility impairments).

3.3.4. Data map

The following table provides a comprehensive overview of the various data categories, variables, and descriptions relevant to traffic and transportation analysis for Gozo. It includes the availability of these data types and their respective data sources, offering a detailed foundation for urban transportation planning and analysis.

Table 19: Gozo-Malta's LL available data

DATA CATEGORIES	DATA VARIABLES	DESCRIPTION	AVAILABILITY	DATA SOURCE

Traffic data	Average Daily Traffic (ADT)	Number of vehicles passing through a specific location on a road or highway within a day	Partially available (not all road classes)	Transport Authority
	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow	Partially available (not all road classes)	Transport Authority
	Vehicle Types and Classifications	Distribution of vehicle types (e.g., cars, trucks, buses, bicycles)	Partially available (not all road classes)	Transport Authority
	Origin-Destination Data	Origin and destination of trips, commuter and freight traffic	Available	Transport Authority
	Traffic Volume	Number of vehicles passing through a specific point or section of road within a given time frame	Partially available (not all road classes)	Transport Authority
	Average Speed	Mean speed of vehicles along a road segment or corridor	Partially available (not all road classes)	Transport Authority
	Free Flow Speed	Speed vehicles would travel at under ideal conditions, unaffected by congestion	Partially available (not all road classes)	Transport Authority
	Congestion Index	Measure of traffic congestion level, often based on travel time compared to free-flow conditions	Partially available (not all road classes)	Transport Authority
	Peak Hour Traffic	Traffic volume and flow patterns during peak hours of the day	Partially available (not all road classes)	Transport Authority
Transport Network	Road Network Characteristics	Lane widths, speed limits, classifications	Limited availability	Department of Transport website
	Bicycle and Pedestrian Infrastructure	Availability of bike lanes, sidewalks, crosswalks	Limited availability	Department of Transport website
Public Transport Services	Timetables	Timetables and schedules for public transport services	Available	Public Transport Operator
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles	Available	Public Transport Operator
	Public Transport Ticketing Data	Data related to ticketing and fare collection on public transport	Available	Public Transport Operator
	Existing Origin-Destination Analyses	Analyses of existing trip origins and destinations	Available	Public Transport Operator

	Average Speed for Vehicles in Urban Environment	Average speed of vehicles in the urban environment	Available (Buses)	Public Transport Operator
	Speed Regulations for the Road Network	Legal speed limits and regulations for road traffic	Available	Online Law Courts
	Demand for On-demand Mobility Services	Data on demand for on-demand mobility services	Available	Public Transport Operator
	Ridership Statistics	Number of passengers using public transit services	Available	Public Transport Operator
	Frequency and Reliability	Frequency of public transit services and reliability	Available	Public Transport Operator
	Accessibility of Stops and Stations	Availability and accessibility of public transit stops and stations	Partial available	Google
	General Transit Feed Specification (GTFS) data, telematics, or other static data	Timetables and schedules for public transport services	Available	Public Transport Operator
Environmental Impact	Air Quality Monitoring Data	Pollutant concentrations, emissions	Publicly available	
	Noise Pollution Levels	Levels of noise pollution along transport corridors	Publicly available	National Transport Model
	Greenhouse Gas Emissions Inventory *1	Emissions from transport sources	Publicly available	
Electric Vehicle Fleet Chargers' Types and Specification -- if applicable	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Publicly available	Energy and Water Agency
	Charging Schedule and Charging Stations Occupation Rates	Schedules and occupancy rates for charging stations	Partially Available *2	Contracted Operator

Notes

**1 = The GHG emission inventory is prepared by the MRA now CAA. ERA can provide the Air Emission Inventory, which is similar in nature to the GHG EI but instead caters for air pollutants such as NOx, PM, SO2, NMVOC, NH3 amongst others.*

**2 = occupation rates of charger can be inferred, Schedule not available*

This information, along with the results of the capability and empathy map, will serve as the foundation for selecting KPIs for each UC to include in the Evaluation Framework that will be developed in the coming months. Further details about the characteristics of the available data in Limassol can be found in Annex II.

For Gozo-Malta's Use Case (On-Demand Mini-Bus Services), available data includes origin-destination analysis, public transport timetables, fleet specifications, ticketing data, demand for on-demand mobility services, ridership statistics, frequency and reliability, speed regulations, and air quality monitoring, mainly sourced from public transport operators and government agencies. However, critical missing data for optimizing on-demand mini-bus services includes real-time traffic flow data, intersection management, parking availability, demand for ride-sharing and micromobility, cost-benefit analysis, and vehicle-to-infrastructure communication, which are essential for improving routing efficiency, operational planning, and user accessibility in the on-demand transport model.

A comprehensive overview of the data availability in all F-LLs can be found in Annex I. Further details about the characteristics of the available data of Athens can be found in Annex II.

3.3.5. Communication channels

The following table provides a mapping of the media and other communication channels necessary for the successful implementation of LLs, and for the communication and dissemination of metaCCAZE activities.

Table 20:. Communication channels of the city of Gozo-Malta

	COMMUNICATION CHANNELS	TARGET AUDIENCE	LINK
1	Facebook	*Community*	https://www.facebook.com/um.iccsd https://www.facebook.com/tallinja https://www.facebook.com/infrastrutturagovmt https://www.facebook.com/transportmaltanews
2	LinkedIn	*Community, Academics, Companies*	https://www.linkedin.com/company/institute-for-climate-change-and-sustainable-development https://www.linkedin.com/company/malta-public-transport/posts/?feedView=all https://www.linkedin.com/company/transport-malta/posts/?feedView=all https://www.linkedin.com/school/university-of-malta/
3	Newspoint	*Students & Academics*	https://www.um.edu.mt/newspoint
4	Webpage	*Students, Academics, Community*	https://www.um.edu.mt/iccsd/projects/metaccaze/
5	Webpage	*Community*	https://infrastructure.gov.mt/metaccaze/

3.4. Status Quo Map for Milan

The City of Milan, located in northern Italy's Po valley, is the second-largest city in the country, spanning approximately 182 km² with a population of about 1.4 million. In the past decade, Milan has seen a population increase of 7.5%, largely driven by an influx of foreigners (making up nearly 20% of the population) and a growth in the youth demographic, especially those aged 20–24. This is closely tied to Milan's status as an educational hub, hosting eight universities with nearly 200,000 students, including 6.7% international attendees. Additionally, the city boasts 20 universities and research centres focusing on environment, energy, and innovation.

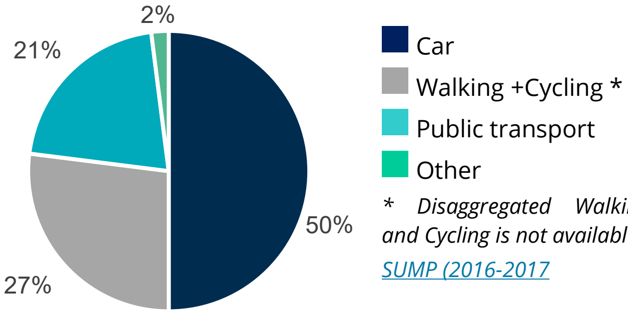
Milan is recognized as Italy's economic and financial capital, home to over 180,000 businesses and the Italian stock exchange. Its global appeal is bolstered by leadership in fashion, design, communication, life sciences, and high-level services. The city also thrives in cultural and educational fields, maintaining its reputation as a vibrant centre for innovation and excellence in various industries.

Milan is a key urban node within the Trans-European Transport Network (TEN-T), playing a pivotal role in connecting the Scandinavian-Mediterranean corridor. This corridor is vital for linking northern and southern Europe, enhancing trade, mobility, and accessibility across major European regions, with Milan serving as a central hub for multimodal transport and logistics.

A FEW FACTS…

Milan has already its EU MISSION LABEL

1,371,850 inhabitants



** Disaggregated Walking and Cycling is not available.*

SUMP (2016-2017

Key facts:
#MetropolitanCity #EconomicCapital #StudentCity #FashionCapital #DesignCapital #InnovationHub #CulturalVibrancy # Economic and financial capital of the country

TEN-T Comprehensive network:
Scandinavian-Mediterranean corridor

Sustainable mobility goals:

- Milan is one of the MISSION CITIES – committed to achieve climate-neutrality by 2030
- Has been awarded the “EU Mission Label” in October 2024
- Its SUMP for the metropolitan area of Milan was approved in 2021 and includes targets and objectives for 2031.

3.4.1. Sustainable mobility planning policies

The city of Milan has a two-tiered Sustainable Urban Mobility Plan (SUMP): one at the city level, approved in 2018, and another at the metropolitan level, approved in 2021. The metropolitan SUMP covers 134 municipalities, with Milan playing a central role. As the more recent plan, the metropolitan SUMP builds upon and integrates the policies established in the city-level plan, ensuring a coordinated approach to transportation and urban mobility.

The metropolitan SUMP focuses on integrating transport networks, improving public transit services, promoting innovative low-impact technologies, expanding soft and shared mobility options, optimizing transport governance, and enhancing safety for vulnerable users such as pedestrians and cyclists. A key priority is reducing the environmental impact of transportation, particularly by curbing pollution from vehicular traffic. Measures include restricting high-emission vehicles, incentivizing cleaner transportation alternatives, and encouraging the adoption of renewable energy-powered mobility solutions, such as electric and hydrogen-powered transport. These efforts are reinforced through a combination of structural improvements, governance strategies, and public awareness initiatives.

The metropolitan SUMP is designed to align with and integrate several key planning frameworks to ensure a cohesive and sustainable mobility system. It incorporates:

- **SUMP of the city of Milan**: The metropolitan SUMP incorporates the City of Milan's SUMP, acknowledging its pivotal role within the broader metropolitan area.
- **Integrated Tariff System (STIBM[3]):** STIBM is the new Integrated Tariff System of the Milan and Monza Brianza Mobility Basin (STIBM); it extends over all the municipalities that are part of the Metropolitan City of Milan, the Province of Milan and Monza and Brianza as well as some municipalities outside the province, which are already part of the SITAM area.
- **Metropolitan Strategic Plan (MSP)**: It aligns with the MSP's objectives for sustainable spatial development and urban growth.
- **Metropolitan Territorial Plan (MTP)**: The SUMP integrates with the MTP, particularly in the planning of transportation infrastructure.
- **LPT Basin Service Program**: Leveraging the Basin Service Program, the SUMP defines and optimizes the public road transport network and service offerings across the metropolitan territory.

Geographical scope:

The Sustainable Urban Mobility Plan (SUMP) for the Metropolitan City of Milan encompasses the entire metropolitan area, which includes 134 municipalities, among them the City of Milan.

Timing:

The SUMP does not have quantitative targets but has included qualitative objectives envisaged for 2031, in line with the metaccaze's use case, such as:

- increase in the number of Local Public Transport (LPT) passengers
- reduction in the percentage of trips by own car
- reduction in road congestion.

SUMP monitoring from its approval:

SUMP includes a two-year monitoring system to check the progressive achievement of the objectives and the effectiveness of the actions taken. However, this has not yet been implemented.

[3] https://www.agenziatpl.it/servizi-tpl/sistema-tariffario-integrato

3.4.2. Climate City Contract policies and metaCCAZE alignment

The following table presents a list of the foreseen actions related to urban mobility included in the CCC. For each action, it has been indicated whether the metaDesigned UCs will contribute to their implementation.

Table 21:. Policies contained in the CCC of Milan

POLICIES CONTAINED IN THE CCC	UC
Public Transportation/Public transport Electrification ○ Expansion of existing transit lines (Municipality) ○ Innovative on-demand public transportation service (metaCCAZE - Milan UC) (Municipality) ○ Complete shift from diesel oil buses to electric buses for the local public transport service (Stakeholders)	✓
Private Vehicle Electrification	
Micro-mobility ○ Extension of the cycle lane network (Municipality) ○ Dedicated bike parking areas, bike repair stations (Stakeholders) ○ Charging points for e-bikes (Stakeholders)	✗
Freight Transportation ○ New electric vehicle fleet for food delivery in schools (Stakeholders)	✗
Traffic and Parking Management ○ Implementation of Area B (Municipality) ○ New limited traffic zones (Municipality) ○ Reduction in car parking lots in Politecnico campuses (Stakeholders)	✗
Smart Technologies ○ Innovative on-demand public transportation service (metaCCAZE - Milan UC) (Municipality)	✓
Sharing services ○ Promotion of car sharing services and carpooling (Municipality - affects demand patterns)	✗

3.4.3. Milan's UCs - Resources and needs

As anticipated in the introduction, Milan proposes a single UC that will be tested within metaCCAZE. A summary of the key takeaways of the ***capability map*** and ***empathy map*** are presented.

Building on the information collected by Milan living lab partners and Università degli Studi di Napoli Federico II (UNINA)), the support partner, the following sections provide, for each UC, a description of the measures to be implemented within metaCCAZE together with the preliminary barriers, existing services potentially related to each UC, and relevant projects, studies and past experiences that could be leveraged. In addition, the sections include the main outcomes of the mini dialogues hosted in Milan on 29th November 2024. The mini dialogue was organized as a virtual round table, involving 8 stakeholders interested by the solution proposed, who provided valuable insights to understand how the UC could be successfully integrated in the living lab.

3.4.3.1. Development of an on-demand e-pod service designed to leverage the improved e-pods autonomous features (MI-UC01)

Table 22:. Milan Use Case 1 – capability

<table>
<tr><th colspan="4">MI-UC01</th></tr>
<tr><th colspan="4">Development of an on-demand e-pod service designed to leverage the improved e-pods autonomous features</th></tr>
<tr><td>USE CASE DESCRIPTION</td><td colspan="3">A new on-demand passenger transport service featuring electric pod vehicles will be launched in a suburban area of Milan to enhance first/last mile and door-to-door travel, integrated with the Local Public Transport network. This service will use e-pods: compact electric vehicles (3.38 m by 2.42 m) that accommodate 9 seated passengers (including the driver) and up to 21 total passengers. E-pods will be equipped with autonomous docking features, enabling them to connect seamlessly into longer units for easier transitions between pods for passengers and reduced congestion.
Throughout the project, enhancements will be made to the autonomous functionalities, including summoning, docking, and undocking, with new autonomous parking capabilities being developed to optimize service operations. As the service will be accessible to the public, special emphasis will be placed on shaping the regulatory framework to fully leverage the e-pods' capabilities. Requests will be made to the Italian Ministry of transport (MIT) to ensure the comprehensive use of the advanced technology.
To summarize, this UC is divided in two measures:
1) on demand service leasing around 6 month, in a suburban area of Milan
2) enhancements to the autonomous functionalities</td></tr>
<tr><td>AREA DESCRIPTI</td><td colspan="3">The areas of the two measures are still to be defined. The service coverage area will be determined during the co-creation process, taking into account both stakeholder input and the outcomes from the service simulator.</td></tr>
<tr><th colspan="2">OBJECTIVES Alignment with:</th><th>SUMP</th><th>CCC</th></tr>
<tr><td colspan="2">Promote more travel by public transport, thereby reducing private traffic and promoting environmental sustainability</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="2">Improve the quality of LPT service in relation to accessibility and user experience by optimizing supply and adapting it to demand</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="2">Increase electric mobility share by contributing to the reduction of pollutant emissions and the decarbonization of the transportation system.</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="2">Validate an innovative scheme in on-demand services, that allow users to change pod during the journey to increase efficiency and service quality</td><td>✗</td><td>✓</td></tr>
<tr><th colspan="4">BARRIERS</th></tr>
<tr><td colspan="4">1. Regulatory framework: To fully leverage the e-pods' capabilities during the service, regulatory intervention from the Italian Ministry of Transport is required. This is an external stakeholder that must support the initiative to ensure comprehensive utilization of the technology.</td></tr>
</table>

2. **Technology development:** Enhancing the platform to optimize the on-demand service is essential, particularly in enabling users to switch between e-pods seamlessly during their journey.

PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC
CITY RESTARTS 2020-2020[4]: This project explored a taxi-sharing service to support public transportation in Milan, initiated by the municipality of Milan, AMAT, ViaVan, and Fondazione Politecnico di Milano in response to Covid-19. It aimed to make better use of underutilized taxi services, allowing users to book shared rides through an app that assigns taxis and optimizes routes. Vehicles were equipped with divider screens to maintain public health and safety. The outcomes of this initiative laid the foundation for the metaCCAZE project's use case, focusing on user flexibility to change vehicles during rides. More details can be found here: **TRIBUTE (2021-2023)[5]:** This project aimed to reduce car dependency in Milan through six sustainable mobility scenarios and highlighted the urgent need to improve local public transportation accessibility to decrease private car use. The findings emphasized the relevance of the Milan use case in the metaCCAZE project, which seeks to enhance public transport accessibility in the metropolitan area.   **deployEMDS (2023-2026)[6]:** Funded by the EU Digital Europe Programme, this project is focused on establishing an operational data space and shared governance for secure and trusted data exchange in urban mobility. In Milan, the use cases include developing a decision support system (DSS) to optimize public transport and planning for future mobility with efficient, zero-emission shared transport. This initiative complements the metaCCAZE project by facilitating better planning of scheduled public transport through on-demand service integration, leading to more efficient operations and improved overall accessibility.

RELATED EXISTING SERVICES	BARRIERS / SOLUTIONS FROM CITY'S MOBIILITY STRATEGIES
Public road transport and mass rapid public transport consisting of subway and LRT lines.	The main objective is to encourage more travel by public transport, thereby reducing private traffic and promoting environmental sustainability. The enhancement of TRM aims to increase the efficiency of the service, in terms of capacity, speed and reliability, making it accessible to all categories of users. <u>Barriers:</u> The construction of TRM infrastructure requires substantial investment and careful planning to ensure proper integration with the existing transportation network. In addition, restrictions imposed by the health emergency have caused a decrease in the use of public road transportation, altering the relationship between supply and demand. <u>Solution:</u> The SUMP proposes several actions to improve public transport, including: techno-economic feasibility studies, infrastructure and technological interventions, integration between different modes of

4 https://www.eiturbanmobility.eu/wp-content/uploads/2020/07/20200701_EIT-Urban-Mobility-COVID19-Response-Call-projects_V6.pdf

5 https://tribute.adrioninterreg.eu/

6 https://deployemds.eu/deployment/milan/

	transport, and improving accessibility at stops. For road transport, the SUMP includes updating the Basin Program to adapt it to the changed mobility needs post-emergency health care.
Electronic ticketing System	The Electronic Ticketing System is designed to monitor and enhance the quality of Local Public Transport (LPT) services by road. This system integrates with bus tracking and passenger counting technologies to collect real-time data on service performance. The primary objective is to elevate service quality by providing essential insights that help optimize supply and better match it to user demand. The real-time data collection capabilities enable continuous monitoring, allowing for the identification of critical issues and prompt interventions to boost efficiency, reliability, and safety of transport services. This approach ensures that services can be adapted proactively to improve user experience and operational standards. Barriers: Implementing innovative technologies requires specific investment and expertise, and managing the data collected requires adequate infrastructure. Solution: SUMP promotes the implementation of these systems as part of a broader strategy to improve the quality of LPT by road. Specific Action A3.4 focuses on the implementation of the Electronic Ticketing System and other innovative systems, while action A3.5[7] aims to implement bus tracking, on-board security, and passenger counting systems.
Electric vehicle charging infrastructure	The electric vehicle charging infrastructure on public land is being developed to address the rising demand for electric mobility. Its primary goal is to promote the adoption of electric vehicles, both private and shared, which in turn helps reduce polluting emissions and supports the broader objective of decarbonizing the transportation system. This infrastructure not only facilitates the transition to cleaner modes of transport but also contributes to improving air quality and advancing sustainability goals. Barriers: Despite the growth in the number of charging stations, the network may not yet be sufficiently widespread to meet demand, especially in suburban areas. Solution: SUMP includes Action A6.9[8], which aims to increase the number of charging infrastructures and consider a coordinating role for the Metropolitan City of Milan in planning location choices and forms of use.
Infomobility systems	Infomobility systems are designed to deliver real-time updates on public transportation services, including schedules, routes, and notifications about any delays or disruptions. The main aim of these systems is to enhance the user experience by providing clear, reliable, and timely information. This empowers passengers to plan their journeys more efficiently and encourages greater use of public transport by ensuring users are well-informed about service conditions. Barriers: The completeness and reliability of information varies depending on the system channel used.

[7] Page 46 of the metropolitan SUMP – Link

[8] Page 52 of the metropolitan SUMP – Link

Solution: SUMP promotes the implementation of integrated infomobility systems that are accessible to all users. Several actions focus on improving user information, both for rail (A1.7), TRM (A2.8) and LPT by road[9] (A3.9).

STAKEHOLDERS LIST	
Public Entities/Academia	Metropolitan City of Milan*
	University Bocconi: Centre for Research on Geography, Resources, Environment, Energy & Networks (Green)*
	University Bicocca: Department of Sociology and Social Research*
Private stakeholders/businesses/operators:	LPT Operator: Autoguidovie SPA*
	LPT Operator: ATM - Azienda Trasporti Milanesi*
	DRT platforms: VIA, NEMI*
	Industry association: Assolombarda*
Citizens groups/associations	*Citizen's advocacy:* Confconsumatori
	*Users advocacy: UTP - Utenti Trasporto Pubblico**

** Stakeholders highlighted with a (*) have participated in the mini dialogue (see below)*

Mini-dialogue for Milan UC01 (MI-UC01)

For the Milan use case, the mini dialogue was organized as a virtual round table involving 8 stakeholders interested by the solution proposed, and who provided valuable insights to understand how the UC could be successfully integrated in the living lab. The stakeholders who participated in the mini-dialogue session included the Metropolitan City of Milan, academic institutions (University Bocconi, University Bicocca), local public transport operators (Autoguidovie SPA, ATM), DRT platform providers (VIA, NEMI), an industry association (Assolombarda), and a local group representing potential users (UTP). The inputs collected during the discussion were elaborated using the Empathy Map methodology and are summarized in the following table.

Table 23: Milan Use Case 1 - empathy

STAKEHOLDER PERSPECTIVE	
Identification of real needs:	• Several areas outside the main transit network of the Milan Metropolitan area are currently undergoing a significant requalification process, also due to relocation of public entities and firms. These areas lack feeder links to the transit network and an efficient and flexible internal distribution system. • University Campuses, with their limited but complex road networks and a regular demand for systematic trips with multiple origins and destinations, could also benefit from such a service. • Flexible transit systems are one of the main topics under discussion at global level, as a necessary complement to main services in order to satisfy demand peaks and/or areas with defined vocation (business, education, shopping, …).
Identification of early	• Pod recharging should be considered when organizing the service.

[9] Page 42, 44 and 46 of the metropolitan SUMP – Link

barriers/concerns:	• Governance models are important. Such an innovative service needs to be adequately homologated and regulated to harmonize with existing services and private vehicles. • Management of moving pod-coupling operations could represent an issue (also from a mechanical point of view). For this first implementation, it is preferable to have static pod coupling. • Currently the pods do not present low-floor entrance for people with reduced mobility.
Specific opinions on the use case:	• Is it possible to include this kind of service among those already subsidized by public transport funding? • The simulator software will play an important role in understanding the ideal dimensioning of the service and maximizing the Use Case impact during its implementation. • Will the service be tested on open roads, or in controlled areas? If the implementation will be on urban roads, what kind of measures are foreseen to deal with the traffic congestion? • Given the possibility of dynamic flexible distribution of users within the pods, how is concretely assigned the position to each customer on the different pods? • Is there already a proposal about service management?

PAIN	GAIN
1. Service costs. 2. Lack of regulation.	1. Flexibility, door-to-door service in areas not covered by transit network. 2. Avoiding modal interchange reduces users' discomfort.

3.4.4. Data map

The following table provides a detailed overview of the various data categories, variables, and descriptions relevant to traffic and transportation analysis for Milan. It includes the availability of these data types and their respective data sources (concerning traffic data, transport technology, environmental and economic impact, energy grid and public transport services as well as passenger behaviour), offering a comprehensive foundation for urban transportation planning and analysis of Milan's UCs.

Table 24:. Milan's LL available data

DATA CATEGORIES	DATA VARIABLES	DESCRIPTION	AVAILABILITY	DATA SOURCE
Traffic Data	KM driven	*Variation of km driven by car by the passengers, thanks to the pilot case*	Publicly available	Survey
Transport Technology	Vehicle-to-Vehicle (V2V) Communication	Communication technologies between vehicles *(numb of communications per day)*	Limited availability	Project partner

	Advanced Driver Assistance Systems (ADAS)	Adoption and prevalence of ADAS technologies	Limited availability	Project partner
Environmental Impact	Air Quality Monitoring Data	*Variation of air pollution emissions by type and source, thanks to the pilot.*	Publicly available	Survey
Economic Impact	Transportation Expenditures	Costs related to transportation, fuel, maintenance *(change for average passenger)*	Publicly available	Project partner
	Economic Benefits of Transport Investments	Job creation, business growth resulting from investments	Publicly available	Project partner
	Cost-Benefit Analysis	Costs and benefits associated with transport projects	Publicly available	Project partner
Energy Grid Data	Transition, distribution, renewable/conventional energy mix, energy price changes	*Variation of energy consumed and type, thanks to the pilot.*	Publicly available	Survey
Public Transport Services	Demand for On-demand Mobility Services	Data on demand for on-demand mobility services	Limited availability	Project partner
Passengers behaviour	Travel time	*Change in travel time of commuting*	Publicly available	Survey

For Milan's Use Case (MI-UC01 - Development of an On-Demand E-Pod Service), available data includes kilometers driven, air quality monitoring, transportation expenditures, economic benefits, cost-benefit analysis, energy consumption variation, and changes in commuting travel time, primarily sourced from surveys and project partners. However, key missing data necessary for optimizing the e-pod service includes real-time vehicle-to-vehicle communication, ADAS adoption rates, detailed demand for on-demand mobility services, and comprehensive traffic flow analysis, which are essential for enhancing autonomous vehicle integration, optimizing service efficiency, and ensuring seamless multimodal connectivity.

A comprehensive overview of the data availability in all F-LLs can be found in Annex I. Further details about the characteristics of the available data of Athens can be found in Annex II.

3.4.5. Communication channels

The following table provides a mapping of the media and other communication channels necessary for the successful implementation of LLs, and for the communication and dissemination of metaCCAZE activities.

Table 25:. Communication channels of the city of Milan

COMMUNICATION CHANNELS	TARGET AUDIENCE	LINK
1 Website AgeTPL	*Citizens, Stakeholders, associations, non-profit organisations, public*	https://www.amat-mi.it/

	administration, research institutes, media, industry, etc.	
2 Website AMAT	*Citizens, Stakeholders, associations, non-profit organisations, public administration, research institutes, media, industry, etc.*	https://www.agenziatpl.it/
3 LinkedIn AMAT	*Citizens, Stakeholders, associations, non-profit organisations, public administration, research institutes, media, industry, etc.*	https://www.linkedin.com/company/amat-agenzia-mobilit%C3%A0-ambiente-e-territorio/mycompany/

3.5. Status Quo Map for Miskolc

Miskolc, Hungary's fourth-largest city, lies in the northeastern part of the country, nestled between the Bükk and Zemplén mountain ranges. With a population of approximately 150,000, it serves as a major hub for administration, economy, and culture. Historically recognized as an industrial centre with a focus on coal mining and metallurgy, Miskolc has shifted its focus in recent years toward education, research, and tourism. As a university city, it is home to the University of Miskolc, which attracts a diverse student body. This academic presence contributes to the city’s dynamic and youthful character while fostering innovation and strengthening the local economy. Miskolc also plays a pivotal role in regional development, leveraging its strategic position for trade and tourism.

The city is a gateway to natural landmarks like Bükki National Park and offers unique attractions such as the historic Diósgyőr Castle and the Miskolctapolca cave bath. These features, alongside a focus on sustainable tourism, showcase its cultural heritage and environmental awareness.

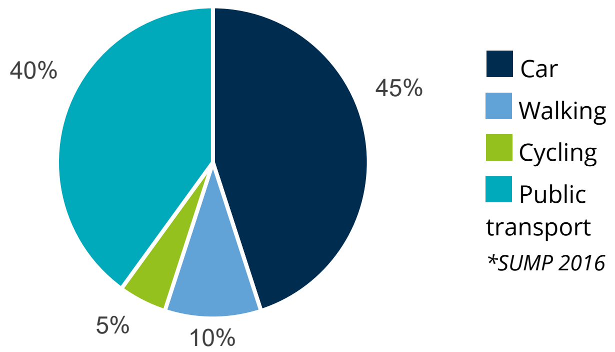
In recent years, Miskolc has embraced a sustainable development approach, prioritized green urban planning and enhanced public transportation. This forward-thinking commitment highlights the city’s innovative spirit and dedication to environmental responsibility, cementing its position as a progressive city in Hungary.

Miskolc is a TEN-T (Trans-European Transport Network) urban node, strategically situated on the Orient/East-Med corridor. This designation highlights its importance in facilitating the seamless movement of goods and passengers across Europe. Being part of this corridor connects Miskolc to major international trade routes, enhancing its logistical significance and positioning it as a key player in Hungary's contribution to European economic and transportation networks.

A FEW FACTS…

Miskolc has already its EU MISSION LABEL in October 2024

147533 inhabitants



Key facts:
#Sustainable Tourism #Innovative Cities #Miskolc Heritage #University City #Green Urban Planning # Major hub for economy and culture

Urban node at the intersection of two TEN-T corridors:
Orient/East-Med corridor

Sustainable mobility strategies:

- Miskolc is one of the MISSION CITIES – committed to achieve climate-neutrality by 2030
- Has been awarded the "EU Mission Label" on the 8th October 2024
- Its SUMP was approved in 2016 and includes targets and objectives for 2030.

3.5.1. Sustainable mobility planning policies

Miskolc's update of the Sustainable Urban Mobility Plan (SUMP) was approved in 2016. It aims to prioritize environmentally friendly transport modes, improve conditions for cyclists and public transport, and create pedestrian-friendly streets. These efforts align with the city's vision of becoming a liveable urban space. SUMP extends beyond sectoral planning, focusing on integrated urban and transport planning. It emphasizes embedding mobility into the urban structure, improving life quality, and serving both the economy and residents' needs.

This plan is an update of the Mobility Plan of 2013, which laid the groundwork with achievements like CNG bus purchases, the Green Arrow project, and Northern Hungary's first CNG station, demonstrating Miskolc's progress in sustainable transport. In addition, the new SUMP also integrate urban planning policies, such as the 2016 Integrated urban rehabilitation master plan.

The SUMP is based on four pillars as overarching goals:

- New urban structure – New main square
- Economic innovation – New industrial park and therefore a new way of creating jobs by also improving regional accessibility
- Smart and sustainable approach – Mobility management and strengthening the role of sustainable modes of transport by moving towards zero emissions
- Quality of life – A lifestyle that helps different generations live together

Although the SUMP was approved in 2016, it only set short-term objectives for 2018, 2020, and beyond. As a result, it is now outdated.

Geographical Scope:

The SUMP area is primarily the city of Miskolc itself. However, it also considers connections with the wider planning area including 38 other municipalities.

The Miskolc agglomeration in northeastern Hungary has a varied landscape with hills and rich natural resources, primarily located in the Bükk mountains. The region is intersected by the Szinva and Hernád rivers, which create fertile valleys. Miskolc, the largest city and economic centre, contrasts urban development with surrounding rural areas featuring forests and farmland.

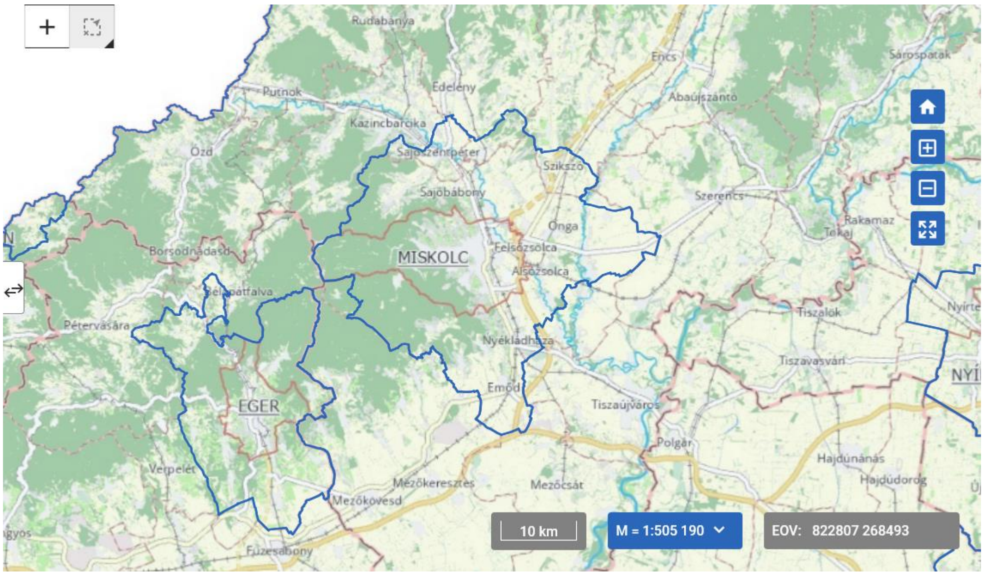


Figure 6. Miskolc agglomeration (source: TEIR)

Timing:

The SUMP was approved in 2016 and it only included short term objectives for 2018, 2020 and after 2020.

Sustainable mobility monitoring schemes:

The monitoring scheme was established by SUMP. However, the associated indicators have not been monitored yet.

3.5.2. Climate City Contract policies and metaCCAZE alignment

Miskolc is one of the Mission cities, and the Climate City Contract was translated into English and was signed by the Deputy mayor, Éva Matiscsák, on October 8, 2024.

The following table presents a list of the anticipated policies related to urban mobility that are included in the CCC. For each action, it is indicated whether the metaDesigned UCs will contribute (or not) to their implementation.

Table 26:. Policies contained in the CCC of Miskolc

POLICIES CONTAINED IN THE CCC	UC
Public Transport/Public Transportation Electrification ○ Development of transport infrastructure to ensure sustainable urban mobility – development of urban rail transport. ○ Development of transport infrastructure to ensure sustainable urban mobility – development of Avas cable car. ○ Electric buses for public transport – electrification of buses. ○ Developing charging infrastructure for public transport – electrification of buses. ○ Hydrogen strategy – clean hydrogen and hydrogen technologies for transport – greening public transport.	✗
Micro-mobility ○ Enhancing micromobility – shift to public transport and non-motorised transport. ○ Road and cycle infrastructure improvements – shift to public transport and non-motorised transport.	✓
Urban Planning Development ○ 15-minute city (neighbourhoods) concept – reduced demand for motorized passenger transport. ○ Traffic calming – reduced need for motorized passenger transport	✓
Traffic and Parking Management ○ Urban parking system – shift to public transport and non-motorised transport.	✗
Private Transport Electrification ○ Increasing electromobility in the private sector – individual car traffic – electrification of cars and motorbikes. ○ Urban charging infrastructure network – electrification of cars and motorbikes.	✓
Freight and Logistic Optimization ○ Enhancing electromobility in the private sector – freight traffic – electrification of trucks. ○ Reducing freight traffic in the city centre – optimized logistics.	✗
Smart Systems ○ Digital transition in public and road transport – shift to public transport and non-motorised transport.	✓
Transport Demand Management ○ Integrated development of urban modal hubs – shift to public transport and non-motorised transport. ○ Traffic calming – reduced need for motorized passenger transport.	✗

3.5.3. Miskolc's UCs - Resources and needs

As anticipated in the introduction, Miskolc proposes two UCs that will be tested within metaCCAZE. For each UC, a summary of the key takeaways of the ***capability map*** and ***empathy map*** are presented.

Building on the information collected by Miskolc living lab partners and BME, the support partner, the following sections provide, for each UC, a description of the measures to be implemented within metaCCAZE together with the preliminary barriers, existing services potentially related to each UC, and relevant projects, studies and past experiences that could be leveraged. In addition, the sections include the main outcomes of the mini dialogues hosted in Miskolc November 14, 2024.

3.5.3.1. Multimodal passenger hub (MK-UC01)

Table 27: Miskolc Use Case 1 - capability

MK-UC01			
Multimodal passenger hub			
USE CASE DESCRIPTION	The pilot project seeks to integrate e-scooters into the public transport system, expanding mobility options for both residents and visitors. At its core is a mobility hub located at the Tapolca junction, a strategic location chosen to support seamless transitions between different transport modes. This hub will function as a multimodal information centre, offering updates on public transport, local transit options, and guidance for users. By incorporating e-scooters directly into the hub, the initiative aims to simplify access and encourage their use as an efficient last-mile solution. This project reflects a commitment to sustainable transport solutions while improving the overall public transport system's functionality. It underscores the city's focus on building a connected, user-friendly urban mobility ecosystem.		
AREA DESCRIPTION	The Tapolca junction, located on the southern outskirts of Miskolc, is a key connection point between the city centre and Miskolctapolca, a well-known tourist area famed for attractions like the Cave Baths. This route is particularly vital during the tourist season due to increased traffic, underscoring its importance for visitors accessing Miskolc’s major landmarks. The junction enhances mobility within the city by linking Miskolc’s core with surrounding areas, including major roads and tourist hotspots. Its proximity to the M30 motorway and main road 3 ensures efficient connections to other cities, such as Budapest and Košice (Kassa), making it a critical component of regional transportation. Additionally, local bus services play a significant role in supporting daily commutes, further integrating this hub into Miskolc’s broader transport network.		
OBJECTIVES	Alignment with:	**SUMP**	**CCC**
Enhance travel convenience and promote environmentally friendly transportation alternatives.		✓	✓
Digital transition in public and road transport		✓	✓
Integrated development of urban modal hubs		✓	✓
Road and cycle infrastructure improvements		✓	✓

Enhancing micromobility	✓	✓
Reduced demand for motorised passenger transport - shift to public transport and non-motorised transport	✓	✓

BARRIERS

Technological integration with third parties: Ensuring the smooth integration of e-scooter technology into existing public transport networks and information platforms can pose significant technical challenges. This process requires robust coordination with third-party service providers and the development of compatible software to enable seamless interaction and data sharing between different transport modes.

Public acceptance: Community acceptance of e-scooter programs can be influenced by factors such as safety concerns, public perception, and doubts about their practicality and impact. Resistance may stem from skepticism about their effectiveness or concerns over road safety, potentially hindering widespread adoption and usage.

PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC

1. **Smart Point project (2011-2021)** for developing passenger information systems: MVK Zrt. was the beneficiary of the project aimed at enhancing public transport infrastructure in the cities of Miskolc and Felsőzsolca. The project's primary objective was to improve real-time passenger information systems through the installation of various audiovisual displays and on-board control units on buses. The initiative took place from June 15, 2011, to September 12, 2016, with a maintenance period extending until September 12, 2021. This is relevant because it also focuses on intermodality, and the insights gained can be applied to the current project.
2. **Sustainable urban electric vehicle project for passenger operations (2021-2022):** In 2021, MVK Zrt. submitted a tender in response to a call for environmentally friendly urban electric transport, aimed at procuring 10 two-axle electric buses and 10 electric vehicle charging units. Implementation began on March 1, 2021, and concluded on October 26, 2022, with a 5-year maintenance period following the project's completion. The first maintenance report was submitted in November 2023. is linked to the current project with electric, zero-emission mobility.

RELATED EXISTING SERVICES	BARRIERS / SOLUTIONS FROM CITY'S MOBIILITY STRATEGIES
MobilON	It is an online portal and a mobile application that serves as a real-time journey planner. Barriers: The service is facing many challenges, including acceptance from users. A new version of the application is planned Solutions: Providing integrated information about mobility is planned in the SUMP.
Tiszta Miskolc (TiMi)	TiMi is an integrated (mobile application and connected CCTV) system supporting security, safety, surveillance and public cleanliness. Barriers: No particular barrier has been identified. The app is working well and a new version was released on 14th October 2024 on both Google Play and the App store. Further development is currently underway. The app is also used by the municipality and the police. However, it is noted that the system provides better walkability through safety and security. Solutions: n/a

Roll-Mi	Roll-Mi cycling application tracks travelled distance, calories burned, time elapsed and quantifies CO_2 savings. Therefore, this promotes a healthy lifestyle towards a more sustainable mobility by motivating citizens through a gamification platform and a handy mobile application. Barriers: No specific problems, it was still available in 2024, but currently it is not working. Solutions: Although the gamification app is not mentioned, SUMP supports cycling in various ways.

STAKEHOLDERS LIST	
Public entities/Academia	Mayor's Office of the City of Miskolc, Department of Transport Management*
	Mayor's Office of the City of Miskolc, Chief Architect's Office*
	Miskolc Police Department*
	Volánbusz Ltd.*
Private stakeholders/ businesses/operators	TIER Operations Hungary Ltd.*
Citizens groups/associations	Miskolc Cycling Association*

** Stakeholders highlighted with a (*) have participated in the mini dialogue (see below)*

Mini-dialogue for Miskolc UC01 (MK-UC01)

A mini-dialogue event took place in Miskolc, Hungary, organized by the Budapest University of Technology and Economics (BME) and MVK. The event featured personal bilateral discussions structured around a brief presentation of the project and its use cases, followed by an open discussion on challenges and opportunities for sustainable urban mobility. The event saw active participation from representatives of the Miskolc mayor's office (covering areas such as city operations, transportation management, climate protection, and architecture),

The mini-dialogue activity for the Shared E-bikes/E-scooter Use Case consisted of in-person, bilateral discussions with responsible local partners. These partners included representatives of the municipality (Miskolc Mayor's Office), transportation operators (Volánbusz, TIER Operations Hungary), a regulatory agency (Miskolc Police Department), and a local association with an interest in facilitating cycling in the city (Miskolc Cycling Association). Participants were invited to the discussions via email and phone through direct local contacts. The mini-dialogue activity consisted of a short presentation of the project and the Use Case, followed by an open discussion about potential problems and opportunities. The results of the session were elaborated using the Empathy Map methodology (see Chapter 2.2) and are summarized in the following table.

Co-funded by the European Union

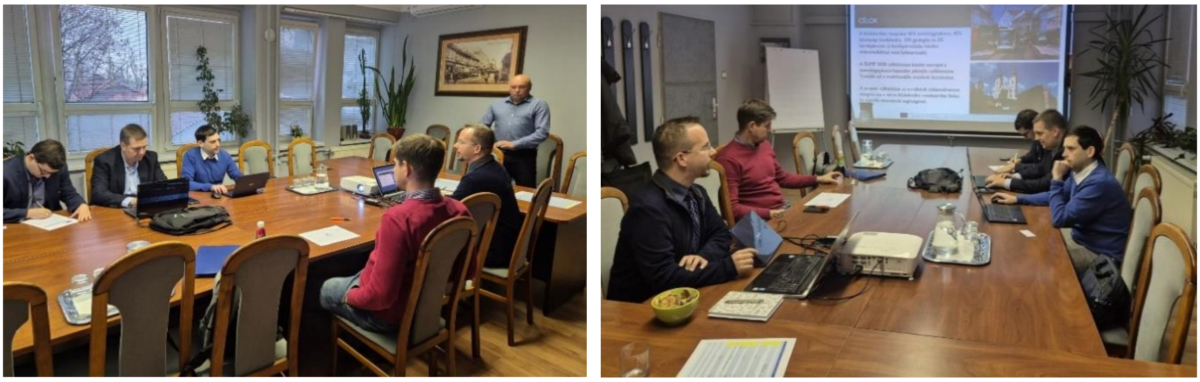


Figure 7. The metaCCAZE event for the Miskolc "Multimodal Hub" and "Enhancing the journey planning system for e-scooter " use cases

Table 28: Miskolc Use Case 1 - empathy

	STAKEHOLDER PERSPECTIVE
Identification of real needs:	• There is a need for innovative solutions among the younger population. • Good physical and digital infrastructure is needed for good user experience. • A comparison of transport modes is needed, including CO2 emissions and travel time. • Usage could be enhanced with good communication and positive information. • A new air quality measurement point may need to be established
Identification of early barriers/concerns:	• There are currently no fixed parking spots for e-scooters
Specific opinions on the use case:	• The hub should serve a purpose besides transportation; cultural events and films could be shown to make it a cultural and media hub as well. • Some concerns about safety with integration of micromobility, and an interest in safety information and notifications to reduce conflict with pedestrians

PAIN	**GAIN**
1. Limited availability of bike storage (currently) 2. Insufficient infrastructure	1. Excellent choice of location with a frequent bike path and bus stops 2. Suitable intermodal hub with various transport modes 3. Cultural events and image films could be shown

3.5.3.2. Enhancing the journey planning system for e-scooter (MK-UC02)

Table 29: Miskolc Use Case 2 - capability

MK-UC02			
Enhancing the journey planning system for e-scooter			
USE CASE DESCRIPTION	The proposed pilot initiative for digital innovation seeks to enhance the existing journey planning system by adding a multimodal route planner that incorporates various transportation options, including e-scooters. This development addresses the increasing demand for efficient and sustainable urban transport solutions. The system will allow users to tailor their travel criteria, including factors such as travel time, cost, CO2 emissions, and health benefits, enabling them to choose travel options that best meet their needs. A major feature of this pilot is the use of artificial intelligence (AI) to optimize journey chains. This will enable the system to assess various travel combinations and provide personalized recommendations, guiding users not just towards the quickest or cheapest routes, but also those that have a reduced environmental impact or promote health and well-being. This focus on sustainability in travel planning aligns with broader environmental initiatives and supports a shift towards greener transport options.		
AREA DESCRIPTION	The service is applicable for the entire geographical area of Miskolc.		
OBJECTIVES	Alignment with:	**SUMP**	**CCC**
Digital transition in public and road transport		✓	✓
shift to public transport and non-motorised transport		✓	✓
Enhancing micromobility		✓	✓
Applications supporting personalised journey planning		✓	✓
BARRIERS			
1. **Technological integration with third party:** Seamlessly incorporating e-scooter technology into existing public transport systems and information services presents significant technical challenges and demands effective coordination between stakeholders. 2. **Competition**: Conflicting business interests may arise between public transport providers focused on service and e-scooter providers driven by profit, impacting cooperation. 3. **Public acceptance***:* There is a potential barrier regarding user adoption of a complex journey-planning application, as passengers may be hesitant to engage with new technology that adds complexity to their travel planning.			
PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC			
Electric Travelling (EME 2018-2020): This aimed to facilitate the implementation and further development of electromobility in urban and suburban areas. The project provided Information and Communication Technology tools to identify tailored e-mobility solutions and ease the introduction of electric vehicles and charging stations into existing transport infrastructures. It assisted travelers in selecting their travel modes and routes while supporting local authorities in guiding e-mobility development.			

The project resulted in the creation of ETSys, which included four integrated modules: ETPlanner, a door-to-door travel planner for EVs; ETCharge, which optimized the allocation of charging stations; ETSim, a multi-agent simulator for simulating travel behavior; and ETReport, a reporting tool for local authorities. The developed products were tested in three case studies located in Budapest, Hungary; The Hague, Netherlands; and Sosnowiec, Poland.

MaaS4EU 2017-2020 (Horizon 2020): The MaaS4EU project aimed to provide quantifiable evidence, frameworks, and tools to eliminate barriers for a cooperative and interconnected EU single transport market focused on the MaaS concept. It addressed challenges at four levels: business, end-users, technology, and policy. The project defined sustainable business models to support collaboration among transport stakeholders, understood user needs, implemented necessary technological infrastructure (a MaaS mobility hub), and identified enabling policy and regulatory frameworks. It provided quantifiable evidence regarding MaaS costs and benefits through three complementary pilot cases in urban, intercity, and cross-border trips across three EU areas (UK, LUX-DE, HU). The consortium included 17 partners from nine countries, encompassing leading industries, renowned research institutions, transport authorities and operators, consultants, and one ministry of transport.

RELATED EXISTING SERVICES
MobilON (an existing journey planner) as well as Tiszta Miskolc (TiMi) and Roll-Mi anticipated in MK-UC01, are also relevant for this UC. For more detailed information on these existing services please refer to MK-UC01

STAKEHOLDERS LIST	
Public entities/Academia	Mayor's Office of the City of Miskolc, Department of Climate Protection*
	Mayor's Office of the City of Miskolc, Department of Transport Management*
	Mayor's Office of the City of Miskolc, Urban Development Department, City Management and Technical Department*
	Mayor's Office of the City of Miskolc, Chief Architect's Office*
	Hungarian Public Roads*.
	MIŐR (Miskolc Municipal Police)*
	Miskolc Police Department*
Private stakeholders/ businesses/ operators:	TIER Operations Hungary Ltd.* HC Linear (partner in metaCCAZE – app developer)*
Citizens groups/associations:	Miskolc Cycling Association*

** Stakeholders highlighted with a (*) have participated in the mini dialogue (see below)*

Mini-dialogue for Miskolc UC02 (MK-UC02)

The mini-dialogue activity for the Shared E-bikes/E-scooter use case consisted of in-person, bilateral discussions with responsible local partners during the same event that hosted the mini-dialogue for ML-UC01 (see above). These partners included representatives of the municipality

(Miskolc Mayor's Office), transportation operators (Volánbusz, TIER Operations Hungary), an infrastructure provider (Hungarian Public Roads), regulatory agencies (Miskolc Police Department, MIŐR), and a local association with an interest in facilitating cycling in the city (Miskolc Cycling Association). Participants were invited to the discussions via email and phone through direct local contacts. The mini-dialogue activity consisted of a short presentation of the project and the use case, followed by an open discussion about potential problems and opportunities. The results of the session were elaborated using the Empathy Map methodology (see Chapter 2.2) and are summarized in the following table.

Figure 8: The metaCCAZE event for the Miskolc "Multimodal Hub" and the "Enhancing the journey planning system for e-scooter" use cases

Table 30: Miskolc Use Case 2 - empathy

STAKEHOLDER PERSPECTIVE	
Identification of real needs:	• There is a need for safety notifications to reduce conflicts with the pedestrians • There is a need for information about the safe parking of e-scooters • The number of available e-scooters in the area could be shown • Daily and weekly aims could be set for CO2 emission • A gamification campaign for CO2 emission reduction could be employed • Usage statistics could be hown in the application • Push notifications concerning CO2 emissions could be provided when planning by travel by car • User profile should be created with default and adjustable parameters • There should be a feedback option to confirm the selection of the transport mode
Identification of early barriers/concerns:	• Lack of bicycle infrastructure • Changing the habits of the older generation is more difficult • Not enough scooters in the city
Specific opinions on the use case:	• E-scooter usage may replace car usage • E-scooters are popular among the younger generation, making adoption likely.

PAIN	GAIN
1. Safety issues 2. No bike-sharing service available 3. No fixed parking spots for e-scooters 4. No bike storage opportunities	1. Statistical data from the application usage. 2. Statistics of e-scooter rentals and distance travelled will be obtained 3. E-scooters are popular among the younger generation, so usage has a chance of being high

3.5.4. Data map

The following table provides a comprehensive overview of the various data categories, variables, and descriptions relevant to traffic and transportation analysis for Miskolc city. It details the availability of these data types and their relevance to pilot projects in each city. Key areas of focus include Traffic Data, Transport Network , Electric Vehicle Fleet Chargers' Types and Specification , Transport Technology , Environmental Impact , Economic Impact , Energy Grid Data , and Public Transport Services .

Table 31: Miskolc's LL available data

DATA CATEGORIES	DATA VARIABLES	DESCRIPTION	AVAILABILITY	DATA SOURCE
Traffic Data	Average Daily Traffic (ADT)	Number of vehicles passing through a specific location on a road or highway within a day	Limited availability	Traffic management agencies
	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow	Limited availability	Transport department records
	Vehicle Types and Classifications	Distribution of vehicle types (e.g., cars, trucks, buses, bicycles)	Limited availability	Traffic management agencies
Electric Vehicle Fleet Chargers' Types and Specification	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Limited availability	EV charging network databases
	Weather Data	Meteorological data including temperature, precipitation, etc.	Limited availability	Meteorological agencies
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Limited availability	Transport department records
Public Transport Services	Timetables	Timetables and schedules for public transport services	Publicly available	Transit schedule data
	Electric Vehicle Fleet Chargers' Types and Specification	Charger types and specifications for electric vehicle fleets	Limited availability	Transit schedule data
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles	Limited availability	Transit authority reports
	Public Transport Ticketing Data	Data related to ticketing and fare collection on public transport	Limited availability	Transit authority reports

Intersection Management	Intersection Management	Management strategies and data for traffic intersections	Limited availability	Transit schedule data

For Miskolc's Use Cases (MK-UC01 - Multimodal Passenger Hub & MK-UC02 - Enhancing the journey planning system for e-scooter) , available data includes public transport timetables, limited information on EV chargers, weather data, public transport fleet specifications, and ticketing data, mainly sourced from transit authorities and transport agencies. However, significant missing data includes real-time traffic flow, congestion patterns, intersection management, bicycle and pedestrian infrastructure, demand for on-demand mobility services, parking data, and environmental impact metrics, which are useful for optimizing multimodal hubs, integrating micromobility, and ensuring seamless connectivity between public and shared transport services.

A comprehensive overview of the data availability in all F-LLs can be found in Annex I. Further details about the characteristics of the available data of Athens can be found in Annex II.

3.5.5. Communication channels

The following table provides a mapping of the media and other communication channels necessary for the successful implementation of LLs, and for the communication and dissemination of metaCCAZE activities.

Table 32: Communication channels of the city of Miskolc

N°	CHANNELS	TARGET AUDIENCE	LINK
1.	Website	*- All age groups seeking online information about public transportation options.* *- Regular and occasional passengers interested in schedules, fares, or services.* *- Business partners and institutions using the company's services or collaborating with the company.* *- Environmentally conscious individuals who prioritize sustainable transportation.*	https://mvkzrt.hu/az-mvk-rol/rolunk/fejleszteseink/metaccaze-projekt
2.	Facebook page	*- Active social media users, primarily younger and middle-aged audiences.* *- Local residents looking for daily updates, service changes, and event information.* *- Passengers who want quick updates and provide feedback.*	https://www.facebook.com/mvkzrt
3.	MobilOn Application	*- Tech-savvy frequent travelers who prefer digital tools for accessing transport information.* *- Locals and tourists seeking real-time updates on schedules and routes.* *- Mobile users who need quick, convenient, and accurate information for travel planning.*	https://mvkzrt.hu/menetrend/mobilon-applikacio
4.	Press Releases	*- Residents of Miskolc and the surrounding area who rely on local news for updates on transportation.*	n/a

Sent to Local Media	*- Middle-aged and older audiences who primarily consume news through traditional media.* *- Companies and institutions that value updates on local public transport developments*

3.6. Status Quo Map for Yvelines

Local Council of *Yvelines* (CD78) is located in the western part of the Paris region. It is made up of 262 rural, peri-urban and urban cities, and extends over 2,284.4 km² for 1,438,266 inhabitants. Regarding transport infrastructures, the Yvelines are crossed by 1,577 km of local roads, as well as by 8 railway lines and numerous cycling routes, including L'Avenue Verte London-Paris, Véloscénie, and Seine à Vélo. Around fifty traffic monitoring points have been installed on departmental roads. Additionally, CD78 collects road accident data.

Yvelines contributes to the development and safety of local roads, the reinforcement of the attractiveness of public transport, a more efficient organisation of modal shift, and accompanies the expected changes in mobility behaviour and usage. CD78 implements a proactive policy to encourage soft mobility and promote alternative modes of transport to cars.

Cities of Poissy, Carrières-sous-Poissy and Triel-sur-Seine are located in north-east Yvelines, near by the river Seine, an area currently undergoing major change. The three towns are linked by the local road 190, which carries an average of around 34,000 vehicles a day and is the main road to the Poissy railway station.

Poissy (population 40,000) is at the heart of these structural changes. Already served by train and a bus network, the town will soon be at the junction of two new public transport infrastructures: EOLE (RER E line) and Tram 13 express. Several projects are planned: the Stellantis industrial site, the redevelopment of the station hub and the development of a large residential area, notably through the creation of an eco-neighbourhood.

Carrières-sous-Poissy (population 18,300) is a fast-growing community, with the development of a 47-hectare '*Coeur de Ville*' including the construction of 3,000 housings (half already delivered at this time), and a 200-hectare business park (straddling Triel-sur-Seine). It's designed to host companies in the eco-construction, eco-materials and energy transition sectors.

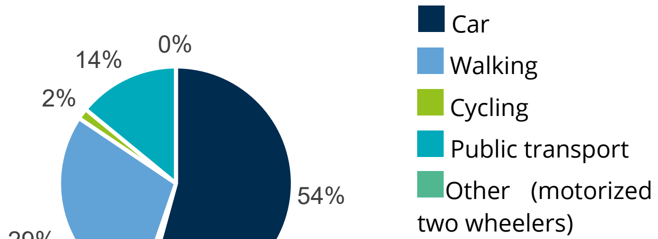
Lastly, Triel-sur-Seine (population 12,400) is aiming to develop its area in a sensible way, with the construction of additional housing and the establishment of economic activities, while preserving the forest and agricultural environment that covers around half the municipal area.

A FEW FACTS…

Poissy, Carrières-sous-Poissy and Triel sur Seine belong to Paris functional urban area

Paris is one of the MISSION CITIES

78.720 inhabitants



** Modal Share of the whole Yvelines Region*

**OMNIL 2020 | Île-de-France Mobilités*

Key facts:
Paris functional urban area #SustainableTourism #EnerrgyTransition #Eco-neighbourhood #SustainableHousing #GreenUrbanPlanning

It is not a TEN-T node.

Sustainable mobility strategies:

- Poissy is within the Métropole du Grand Paris (MGP) and is also part of the Île-de-France region, making it an integral part of the Paris metropolitan area.
- Carrières-sous-Poissy and Triel-sur-Seine are not within the administrative boundaries of the Métropole du Grand Paris, but they still belong to the Paris functional urban area. This means they are considered part of the broader Paris metropolitan area based on commuting and economic ties.
- Paris is one of the MISSION CITIES. However, Climate City Contract is not yet in the agenda of the Yvelines department
- Its SUMP was approved in 2015 and includes targets and objectives for 2020.

3.6.1. Sustainable mobility planning policies

The *'Schéma des Déplacements des Yvelines'* (travel master plan of Yvelines), adopted in 2015, sets out the main thrusts of the local mobility strategy through a multimodal vision of travel. It provides a framework to improve travel conditions throughout the territory. The main objectives and challenges include improving intermodality and taking greater account of sustainable development in road design.

In particular, some of the objectives supported or implemented by CD78 aim to:

- Enhance public transport accessibility and efficiency.
- Improve the fluidity and safety of the local road network through optimized road design.
- Promote alternative mobility solutions, such as car sharing, public transport on motorways, demand-responsive transport, and large-scale automated driving tests.

Geographical scope

The geographical scope of the mobility plan is the Yvelines area. It is a part of the Île-de-France region in France, corresponds to the administrative department labelled as "78." Its territory includes 4 main districts (arrondissements): Versailles, Saint-Germain-en-Laye, Rambouillet, and Mantes-la-Jolie. Within these, there are 39 cantons (townships) and 262 communes (municipalities)

Yvelines also hosts a mix of urban centres, suburban towns, and rural areas. Some of its notable cities include Versailles (its administrative capital), Sartrouville, Mantes-la-Jolie, Saint-Germain-en-Laye, Poissy, and Rambouillet. These municipalities, alongside others, contribute to the basin's geographic and demographic composition, serving as residential, cultural, and economic hubs.

Timing

The SUMP was approved in 2015 and included targets and objectives for 2020. However, the implementation has been delayed and is still running.

Sustainable mobility monitoring scheme

The *'Schéma des Déplacements des Yvelines'* does not foresee a monitoring plan.

3.6.2. Climate City Contract policies and metaCCAZE alignment

Climate City Contract is not yet in the agenda of Yvelines.

3.6.3. Yvelines' UCs - Resources and needs

As anticipated in the introduction, Yvelines proposes two UCs that will be tested within metaCCAZE. For each UC, a summary of the key takeaways of the ***capability map*** and ***empathy map*** are presented.

Building on the information collected by Yvelines Living Lab partners and Vedecom, the Support Partner, the following sections provide, for each UC, a description of the measures to be implemented within metaCCAZE together with the preliminary barriers, existing services potentially related to each UC, and relevant projects, studies and past experiences that could be leveraged. In addition, the sections include the main outcomes of the mini dialogues among the stakeholders hosted in Yvelines on January 24th, 2025.

3.6.3.1. Intelligent Road and Smart Traffic Management (PO-UC01)

Table 33: Yvelines Use Case 1 - capability

PO-UC01	
Intelligent Road and Smart Traffic Management	
USE CASE DESCRIPTION	This UC involves equipping sections of the existing road with smart technologies. It focuses on implementing advanced Vehicle-to-Everything (V2X) technologies to improve traffic efficiency and infrastructure management. By equipping road networks with V2X capabilities, intelligent traffic management systems can be deployed to optimize mobility. Utilizing data from drones, sensors, and cameras, these systems enable real-time monitoring and management of connected vehicles while supporting infrastructure operations, such as roundabout manoeuvres and parking management. The initiative demonstrates the transformative potential of smart infrastructure in fostering an efficient, interconnected mobility ecosystem.
AREA DESCRIPTION	The Living Lab is focused on the Poissy rail station, a key mobility hub connecting Carrières-sous-Poissy and Triel-sur-Seine. Handling over 10 million passenger trips annually, this hub is a critical component of the regional transport network, supported by 14 bus lines and 2 train lines. The deployment of sensors, cameras, drones, and V2X communication infrastructure will take place at strategic locations, including: • The bus terminal at the Poissy mobility hub. • The parking lot of the Poissy mobility hub. • The parking lot of the Triel-sur-Seine mobility hub. • A roundabout serving as a bottleneck for Poissy mobility hub access. • The corridor connecting the two mobility hubs. • Carpooling vehicles and service points. These installations aim to optimize connectivity and enhance the efficiency of the smart transport ecosystem in the region.

OBJECTIVES Alignment with:	**SUMP**	**CCC**
Implement V2X technologies to establish communication between vehicles and infrastructure, enhancing traffic flow in and around between the mobility hub	✓	✗
Utilize data-driven solutions such as drones, sensors, and cameras to collect and analyse real-time traffic data for advanced supervision and optimized traffic management.	✓	✗
BARRIERS		

1. **Technological challenges:** Integrating V2X technologies with existing infrastructure could face compatibility issues, alongside challenges in ensuring the reliability and accuracy of data collected from sensors, drones, and cameras. Limited interoperability between current connected vehicle systems and traffic management platforms may further delay the implementation of a fully operational smart traffic management system.
2. **Regulatory constraints**: Addressing data privacy and security concerns related to the collection and use of traffic data is critical. Additionally, regulations surrounding the deployment of drones for traffic flow analysis could present legal and administrative hurdles.
3. **Operational constraints**: Effective coordination among various stakeholders, including territories, departments, operators, and technology providers, may lead to delays and inefficiencies in project execution.

PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC
RD190 requalification project (2020-2021): It is public utility project: Traffic study for reconfiguration of RD190 under a public survey – focus on infrastructure. Public information provided through website and surveys and Exposition in city hall. Regarding this project, it was declared of public utility in 2021, after a public inquiry phase that took place in 2020.

RELATED EXISTING SERVICES	BARRIERS / SOLUTIONS FROM CITY'S MOBIILITY STRATEGIES
Self-service electrical bikes and scooters – Département but by GPSEO (grand Paris seine et oise)	The service supports short-distance travel and promotes low-carbon micromobility in the region. With a fleet of 1,400 rental vehicles, it facilitates convenient trips across three urban centers: Poissy, Les Mureaux, and Mantes-la-Jolie. <u>Barriers:</u> The number of scooters and bicycles available in each municipality varies based on user movement between municipalities within the same hub. However, the total number of vehicles per hub remains fixed. This service operates on an experimental basis within seven voluntary municipalities, grouped across three urban centers. The continuation of this service will depend on user demand and acceptance <u>Solutions:</u> n.a.
Charging stations for cars – managed by Alizé	The initiative provides a comprehensive electric vehicle (EV) charging solution designed to meet the needs of communities, businesses, and individual users. It aims to support local governments and private enterprises in the deployment and operation of charging infrastructure while facilitating the marketing of these services to individuals through an advanced digital platform. This effort is part of a broader strategy to encourage the shift towards decarbonized mobility, promoting sustainable transportation options that contribute to reducing carbon emissions and fostering cleaner urban environments. <u>Barriers:</u> No particular barrier has been identified. <u>Solution:</u> n/a

STAKEHOLDER LIST	
Public entities/Academia	EPI 78/92 (Etablissement Public Interdépartemental Yvelines-Hauts de Seine)

	The GPSEO Urban Community (Grand Paris Seine et Oise)*
	Conseil Départemental des Yvelines (CD78)*
	Ile-de-France-Mobilités (IDFM)*: The governmental authority that controls and coordinates the different public transport network and the rest of the Île-de-France region.
	Institute VEDECOM*
Private stakeholders/ businesses/ operators	KEOLIS* (Bus Transport Operator operating in different sectors of il-de-France)
Citizens groups/associations	Residents near the mobility hub

Mini-dialogue for Poissy, Carrières-sous-Poissy and Triel sur Seine UC01 (PO-UC01)

The mini-dialogue activity for the use case "**Intelligent Road and Smart Traffic Management**" provided bilateral discussions with responsible local partners including the GPSEO Urban Community (Grand Paris Seine et Oise), and Ile-de-France-Mobilités (IDFM). The GPSEO Urban Community organizes the transport policy within and to its responsible municipalities. It's main responsibilities include promoting sustainable travel throughout the whole territory, setting up different types of services to promote public transport integrated with other modes of transport. In addition to these local partners, the Conseil Départemental des Yvelines (CD78) was invited for their role in transportation management, along with the research institute VEDECOM, and finally the private company KEOLIS who will be in charge of operating the DSP 34 line through Yvelines. Participants were invited to participate in the virtual discussion via email through direct local contacts. The mini-dialogue activity consisted of a short presentation of the project to the stakeholders, followed by an open discussion about potential problems and opportunities that may appear with respect to the UC, and finished with a Q&A session. Topics of the mini-dialogue session included the following questions regarding the impacts of the use case on programmes run by GPSEO and IDFM:

- How could the use case enhance the public transport operation (bus, RER) and could be integrated into existing public transport management platforms such as the one with IDFM?
- How could the use case encourage more collective and rational use of cars for the purpose of supervision of connected vehicles in the area?
- How could the use case improve access to train stations (particularly 2 mobility hubs) during peak time?

The results of the session were elaborated using the Empathy Map methodology.

Table 34: Yvelines Use Case 1 - empathy

	STAKEHOLDER PERSPECTIVE
Identification of real needs:	• Need to encourage cycling - soft modes project between Carrières and Triel • Bicycle connection on RD190 (Route to be identified) • Need to improve traffic flow

Identification of early barriers/concerns:	• Infrastructural requirements for Carpooling services such as charging stations • Convincing stakeholders about benefits of the data-driven solution
Specific opinions on the use case:	• IDFM – Bus fleets in the area are already geolocated by GPS system and are connected to signage. It is necessary to identify what we do with the data collected and the reason for assessing and analysing traffic congestion. • The whole objective of IDFM as authority is transition to lower emissions. It is important to identify the ultimate goal of the use case • Connected infrastructure: IDFM develops traffic light priority, identifies black spots and deploys priority. Traffic light controllers are connected to a server. Thanks to this, we gained 6 buses and 3 drivers, regularity +3, and it only cost 600 euros. Today we know where we need to act (by installing boxes on the bus) • Connected infrastructure: GPSEO: interested in having more static data in real time, but connected infrastructure and signage are not its area of expertise. Keolis: given the daily congestion on the Carrières-Poissy connection, we're waiting for the exclusive right-of-way project to improve commercial speed. Despite the increased frequency, we still have some problems • CD78: Dynamic PMV (Variable Message Signage) panels on the Poissy bridge were complicated to implement. If we are considering signage, perhaps we can think of implementing it towards Triel.

PAIN	EXPECTED GAIN
1. The difficult application of solution after the end of project due to multi-stakeholder management setup which needs to be implemented. A strategy to address this barrier should be foreseen when developing the BIGMs. 2. Stakeholders need to see the proof of the functionality of this data-driven solution. Therefore, it is necessary to include other stakeholders about the results and Gains of the project, before we are able to to scale up the solution after the project.	1. Improve Traffic congestion 2. Reduction of Gas Emissions 3. Improve Quality of life of Citizens 4. Advance in the multi-stakeholder management setup

3.6.3.2. Shared Vehicle Services for Enhanced Mobility (PO-UC02)

Table 35: Poissy, Carrières-sous-Poissy and Triel sur Seine Use Case 2 - capability

PO-UC02

Shared Vehicle Services for Enhanced Mobility

USE CASE DESCRIPTION	The second use case focuses on operating shared vehicle services, particularly carpooling, to enhance connectivity between the mobility hub and nearby residential, commercial, and industrial zones, while simultaneously testing and validating V2X technology. These services will cater to local commuting needs, aiming to reduce single-occupancy vehicle trips and encourage sustainable mobility options. The UC will involve both, EV's (Electric vehicles) and an AV (Automated vehicle). By incorporating carpooling into the area's existing mobility framework, this initiative will demonstrate how shared services can alleviate congestion and enhance accessibility, all while being supported by intelligent traffic management systems.
AREA DESCRIPTION	The Living Lab focuses on the Poissy rail station, a central mobility hub that links the cities of Carrières-sous-Poissy and Triel-sur-Seine. The carpooling service within this framework will function as a same-origin, different-destination model. Starting from the mobility hub, the service will facilitate trips to various destinations, aiming to enhance regional connectivity and support sustainable mobility initiatives.

OBJECTIVES	Alignment with: SUMP	CCC
Reduce single-occupancy vehicle trips by promoting shared mobility services	✓	x
Evaluate the impact of shared vehicle services on mobility patterns	✓	x

BARRIERS

1. **Technological challenges:** Integrating shared mobility services with the schedules of existing public transportation systems poses significant challenges, particularly in maintaining compatibility and seamless coordination. Ensuring reliable real-time vehicle tracking is also critical to enhance user convenience and trust in the system.
2. **Social resistance:** Trust issues among users regarding sharing rides with strangers could hinder adoption. Additionally, concerns about the reliability and convenience of shared mobility options compared to private transportation may limit public acceptance.

PREVIOUS STUDIES, ANALYSIS OR TESTS OF POTENTIAL INTEREST FOR THIS UC

non previous studies, analysis or tests were identified.

RELATED EXISTING SERVICES

"Self-service electrical bikes and scooters" and "Charging stations for cars" are also relevant for this UC. For more detailed information on these existing services please refer to PO-UC01.

STAKEHOLDER LIST

Public entities/Academia	Conseil Départemental des Yvelines (CD78)*
	Ile-de-France-Mobilités (IDFM)*: The governmental authority that controls and co different public transport network and the rest of the Île-de-France region
	Institute VEDECOM*

Private stakeholders/ businesses/operators:	KEOLIS*(Bus Transport Operator operating in different sectors of il-de-France)
Citizens groups/associations:	Residents near the mobility hub
	STELLANTIS

Mini-dialogue for Poissy, Carrières-sous-Poissy and Triel sur Seine UC02 (PO-UC02)

The mini-dialogue activity for the use case "**Shared Vehicle Services for Enhanced Mobility"** was conducted in a similar fashion to that of the use case **"Intelligent Road and Smart Traffic Management**". Bilateral discussions were conducted with key local partners, including the GPSEO Urban Community (Grand Paris Seine et Oise) and Île-de-France Mobilités (IDFM), complete with a Q&A session. These discussions aimed to evaluate different strategic perspectives of stakeholders for managing shared mobility services (carpooling) within the traffic flow of various mobility hubs. The goal was to assess how the supervision of connected vehicles could positively impact traffic flow and enhances user accessibility from train stations to nearby activities of mobility hubs. Furthermore, specific topics discussed during the session included:

- KEOLIS: for application of supervision on access to mobility hubs and passenger demand
- Stellantis and IDFM: for application of carpooling service for employees and parking availability supervision
- IDFM: for application of carpooling service and integration with the local ecosystem

The results of the session were elaborated using the Empathy Map methodology.

Table 36: Yvelines Use Case 2 - empathy

	STAKEHOLDER PERSPECTIVE
Identification of real needs:	• There is a need to promote cycling • There is a need to integrate public transport with other services
Identification of early barriers/concerns:	• Authorisation for operating carpooling service in the Yvelines Department between two mobility hubs
Specific opinions on the use case:	• It is important to assess if the service is well articulated with existing public transport services, notably line 42. • Regarding the Carpooling services: IDFM has authority in Ile de France, therefore it is necessary to identify authority for the operation of this services during the project.
PAIN	**GAIN**
1. Due to the cost of implementing the solution, the RD190 project had to be postponed, and this caused the delay in implementing dedicated lines for buses.	1. Improvement of Dynamic traffic lights 2. Reserved line for Bus operations in the area

3.6.4. Data map

The following table provides a comprehensive overview of the various data categories, variables, and descriptions relevant to traffic and transportation analysis for Yvelines Region. It details the availability of these data types and their relevance to pilot projects in each city. Key areas of focus include Traffic Data, Transport Network, Electric Vehicle Fleet Chargers' Types and Specification, Transport Technology, Environmental Impact, Economic Impact, Energy Grid Data, and Public Transport Services.

Table 37: Yvelines's LL available data

DATA CATEGORIES	DATA VARIABLES	DESCRIPTION	AVAILABILITY	DATA SOURCE
Traffic KPIs	Average Daily Traffic (ADT)	Number of vehicles passing through a specific location on a road or highway within a day	Available	Counting station
	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow	Available	Traffic modelling data
	Vehicle Types and Classifications	Distribution of vehicle types (e.g., cars, trucks, buses, bicycles)	Available	Counting station
	Traffic Volume	Number of vehicles passing through a specific point or section of road within a given time frame	Available	Counting station
	Free Flow Speed	Speed vehicles would travel at under ideal conditions, unaffected by congestion	Available	Google Maps
	Congestion Index	Measure of traffic congestion level, often based on travel time compared to free-flow conditions	Available	Traffic Modeling Data
	Peak Hour Traffic	Traffic volume and flow patterns during peak hours of the day	Available	Traffic Modeling Data
Transport Network	Road Network Characteristics	Lane widths, speed limits, classifications	Available	Department of Mobility
Electric Vehicle Fleet Charger's Types and Specification	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Available	Company website
	Weather Data	Meteorological data including temperature, precipitation, etc.	Available	Open Source
Intersection Management	Intersection Management	Management strategies and data for traffic intersections	Available	Department
Public Transport Services	Timetables	Timetables and schedules for public transport services	Available	Transportation
	Electric Vehicle Fleet Chargers' Types and Specification	Charger types and specifications for electric vehicle fleets	Available	Transportation

	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Available	Transportation
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles	Available	Transportation
	Average Speed for Vehicles in Urban Environment	Average speed of vehicles in the urban environment	Available	Transportation
	Speed Regulations for the Road Network	Legal speed limits and regulations for road traffic	Available	Transportation
	Mobility Hub Infrastructure Specification	Specifications of mobility hub infrastructure	Available	Transportation

For Yvelines Use Cases (PO-UC01 - Intelligent Road and Smart Traffic Management & PO-UC02 - Shared Vehicle Services for Enhanced Mobility), available data includes average daily traffic, congestion levels, traffic volume, free-flow speed, peak hour traffic, intersection management, EV charger locations, public transport timetables, fleet specifications, and mobility hub infrastructure, primarily sourced from counting stations, traffic modeling data, and transportation agencies. However, critical missing data includes real-time origin-destination analysis, vehicle-to-vehicle communication, ADAS adoption, air quality monitoring, economic impact assessments, parking availability, and demand for on-demand mobility services, which are essential for optimizing smart traffic management, integrating shared mobility solutions, and improving road infrastructure planning for enhanced efficiency.

A comprehensive overview of the data availability in all F-LLs can be found in Annex I. Further details about the characteristics of the available data of Athens can be found in Annex II.

3.6.5. Communication channels

The following table provides a mapping of the media and other communication channels necessary for the successful implementation of LLs, and for the communication and dissemination of metaCCAZE activities.

Table 38: Communication channels of the city of Yvelines

N°	COMMUNICATION CHANNELS	TARGET AUDIENCE	LINK
1.	Department Yvelines Website	*Residents*	http://www.yvelines.fr
2.	Social Media Linkedin	*Transport related Stakeholders and other departments and residents*	https://fr.linkedin.com/company/d%C3%A9partementyvelines

4. Conclusion

4.1. Summary of the Status Quo Maps

The Status Quo Map has provided a robust foundation for understanding the existing landscape, identifying needs and challenges, and mapping available resources—such as data, knowledge, and technologies—across the F-LLs. The analysis highlights the diverse urban mobility landscapes across the six cities, with varying levels of public transport reliance, car dependency, and predisposition toward sustainable mobility. Cities with a Climate City Contract (CCC) show strong alignment with their objectives, leveraging well-structured Use Cases (UCs) to enhance efficiency, cost-effectiveness, and innovation. Prior experience with mobility projects, as seen in Athens, Krakow, and Miskolc, can potentially build the bases for smoother implementation.

However, significant barriers—such as regulatory hurdles, infrastructure limitations, and operational challenges—must be addressed early in the co-creation process. Stakeholder engagement and co-creation process will play a crucial role in ensuring that mobility solutions are both effective and widely accepted. Strong governance and collaborative efforts will be essential for the successful implementation of the UCs.

The outcomes of the analysis have been consolidated into a final summary table that condenses the essential findings and drawn conclusions.

This table presents a holistic overview of the main parameters and insights derived from each city's Status Quo Map. It is structured to facilitate comparison and to provide a basis for future fertilization and cross-fertilization activities (Task 1.6) as well as the definition of prototype UCs and BIGMs. The key aspects using standardized representations and keywords, covered the following:

Size: number of inhabitants

Modal Split: the percentage share of each mode of transport

TEN-T network: related corridors of interest

CCC: Climate City Contract status of advancement

UC: Use Case code

Identification of the UC area: identified or not when writing this deliverable

Objectives alignment with CCC: number of objectives aligned with the Climate City Contract

Experience from previous projects: learnings from related and relevant projects

Experience from existing services: learning from related and relevant existing services

Preliminary barriers: Use Case identified barriers

Objectives alignment with CCC: number of objectives aligned with the Climate City Contract

Common gains: Most common gains identified during Mini dialogues, common to all LLs

Common gains (Rank per LL): common gains identified during Mini dialogues by each LL

Common Pains: Most common pains identified during Mini dialogues, common to all LLs

Common Pains (Rank per LL): common pains identified during Mini dialogues by each LL

Availability of traffic-related data: Percentage of traffic-related data in relation to the total data variables identified in Chapter 3.1.3, according to the Data Map Methodology.

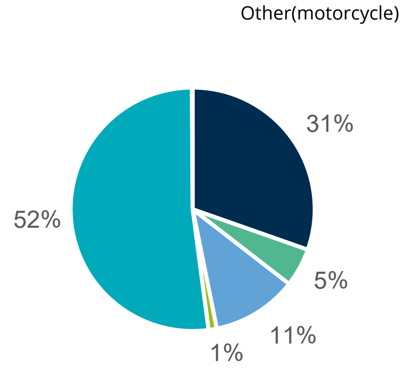
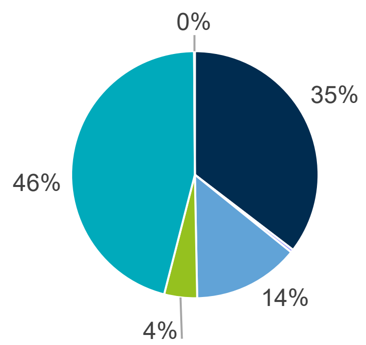
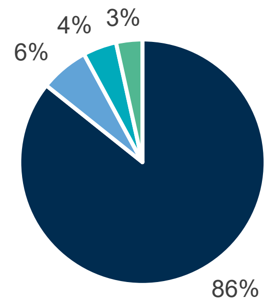
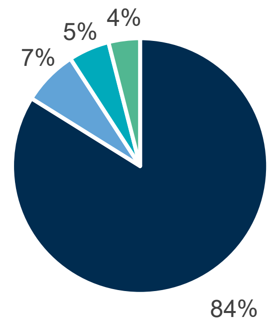
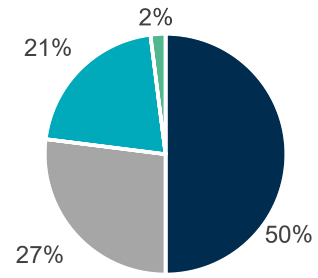
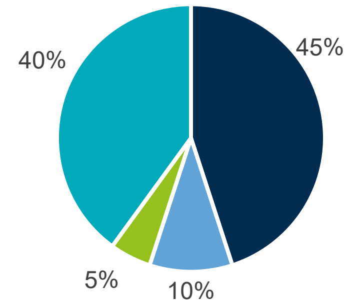
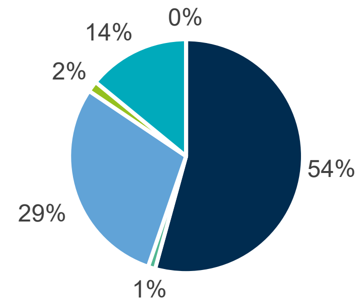
Spatial coverage: Spatial coverage of available data

Data quality/reliability: Data quality/reliability according to the Data Map Methodology.

Data sources: Most common data sources identified in Data Map.

Spatial resolution: Most common Spatial resolution identified in Data Map.

Table 39: Summary of Status quo maps

	ATHENS		KRAKOW		GOZO -	MALTA	MILAN	MISKOLC		YVELINES	
Size	643.452 inhabitants		806.201 inhabitants		39.287 inhabitants	542.051 inhabitants	1,371,850 inhabitants	147.533 inhabitants		78.720 inhabitants	
Modal Split							 * Disaggregated Walking and Cycling is not available				
	Car Walking Cycling Public transport Other Cycling+Walking (*)										
TEN-T network	Rhine - Danube - Mediterranean		North Sea-Baltic Sea Corridor and the Baltic Sea-Black Sea-Aegean Sea Corridor		Valetta (Malta is an urban node. Cirkewwa (Malta) and Mgarr (Gozo) are maritime ports (comprehensive).		Scandinavian-Mediterranean Corridor	Orient/East-Med Corridor		Not a TEN-T node	
CCC	**Ongoing**		Signed		**Ongoing**		Signed	Signed		**No**	
UC	AT-01	AT02	KR-01a	KR-01b	GO-01		MI-01	MK-01	MK-02	PA-01	PA-02
Identification of the UC area	✓	✓	✓	✓	✓		X	✓	✓	✓	✓
Objectives alignment with CCC	5/5	4/4	3/3	1/1	*n/a*		4/4	6/6	4/4	*n/a*	*n/a*
Experience from previous projects	✓	✓	✓	✓	✓		✓	✓	✓	✓	No
Experience from existing services	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Preliminary barriers	#Regulatory barriers #Delays due to bureaucratic or procurement procedures #Inaccuracy of input data		#Location and infrastructure #Tender for cargo bikes #Construction permit		#Infrastructure upgrades #Public acceptance #Legal and insurance framework		#Regulatory framework #Technological development	#Technological integration with third party #Competition #Public acceptance		#Technological challenges #Social resistance #Regulatory constraints #Operational constraints	

Common gains	Operational Efficiency Environmental Benefits	Data Collection and Innovation	Improved Accessibility and Integration	Economic and community benefits	Reduction in Costs	
Common gains (Rank per LL)	#1 Cost reductions #2 Environmental benefits #3 Improved operational efficiency	#1 Economic and community benefits #2 Data collection and innovation #3 Increase the reach of the public transport system	#1 Improved accessibility for different population groups #2 Boost for business and tourism #3 Environmental impact	#1 Increase the reach and flexibility of transport #2 Improve user experience	#1 Transport hub at a prime location #2 Increased options and opportunities for transport modes #3 Encourage participation in cultural events and film showings	
Common Pains	Cost and Financial Constraints	Infrastructure Issues	Service Limitations	Space Constraints	Safety Concerns	
Common Pains (Rank per LL)	#1 Infrastructure and space constraints #2 Cost and financial constraints #3 Need for specialized training	#1 Infrastructure constraints #2 Technical constraints #3 Safety concerns	#1 Perception and Acceptance #2 Infrastructure issues #3 Limited impact	#1 Service cost #2 Lack of regulations	#1 Storage limitations #2 Infrastructure issues #3 Safety concerns	
Availability of traffic-related data	44%	39%	68%	80%	49%	56%
Spatial coverage	Street level, Census tract-level, Charging station-level, Service area-level, National Level, Lane-level, Vehicle-level, Neighborhood-level	Local (Urban: intersections), Metropolitan, Corridor-level, National, Local	Data Available of Arterial, Distributor, Local Access Roads, National, Global, Fleet, Fleet, Global, Regional	Project scale, Vehicle-specific	Local urban intersections, Citywide, Nationwide, National	Departmental roads, Neighborhood, Country, Specific points, Intesections, Point level
Data quality/reliability	High (consistently across all entries)	High, Medium (alternates between high and medium quality)	High, Medium (mostly high with some medium quality)	Medium, High (mostly medium quality with some high quality)	High, Low, Medium (mix of high, low, and medium quality)	High, Medium (mostly high with occasional medium quality)
Data sources	Traffic counters, sensors, Google Maps, Traffic surveys, government records (including research by OASA, and modal choice data from the SUMP of Athens 2021), TomTom & Google Maps, OSM, OASA/OSY, Meteorological agencies, Minister of Development and Investments, OASA Telematics, Department of Transport, Environmental monitoring agencies, Public Transport Operator	Traffic counters, sensors, Traffic surveys, government records, Traffic modeling data, Transport Authority, Department of Transport website, Meteorological agencies, Traffic management agencies, Public Transport Operator, State-owned company managing the National Electricity System	Transport Authority, Survey, Traffic modeling data, Department of Transport website, EV charging network databases, Public Transport Operator, Air pollutant concentrations data, Air emissions data, National Transport Model data	Traffic management agencies, Project partner, Survey, Traffic modeling data, Environmental monitoring agencies, National Transport Model data, Air pollutant concentrations data, Air emissions data, Online mapping services	Traffic management agencies, Transport department records, Counting station, EV charging network databases, Meteorological agencies, Transit schedule data, Transit authority reports, Air pollutant concentrations data, Air emissions data, Contracted operator	Counting station, Departmental traffic records, Company website, Transit authority reports, Public Transport Operator, Transit schedule data, Environmental monitoring agencies, Minister of Development and Investments, Online mapping services, National Transport Model data, Google Maps, Traffic Modelling Data, Open Source, Counting and Own estimation, Transportation
Spatial resolution	Intersection-level, Street level, Census tract-level, Corridor-level, Charging station-level, Service area-level, National Level, Lane-level, Neighborhood-level	Intersection-level, Metropolitan, Corridor-level, Local-level, National Level, National level	National Level, National Level (199 zones of NTM), Corridor-level, Street-level, Service area-level, Station-level, Street-level (data also available per building)	Project-level, Vehicle-level, Service area-level, Charging-station level, Sector, Citywide	Roadsegment, Citywide, Intersections, Charging-station level, Citywide, Sector	Specific points, Road-level, Exact localization, Sector, Intersections, Citywide, Street-level, Point-level, Biennial

4.2. Next steps

4.2.1. Use case and Business Innovation and Governance Models

Following the preliminary assessment of each F-LL's capabilities, stakeholder needs, and data availability through the Status Quo map, the design and prototyping of Use Cases (UCs) and the development of Business Innovation and Governance Models (BIGMs) will take place. Task 1.2 will focus on creating prototype UCs detailing smart systems, services, user interactions, and technical requirements, while Task 1.3 will define collaborative roles and value creation mechanisms within the BIGMs. These will be developed through the same structured metaDesign approach that is being used by the T-LLs (See Annex 1 - - Guidelines for metaCCAZE metaDesign activities – of the deliverable D1.2 - Cross-fertilisation and transferability framework and guidelines). The activities are structures to actively involve citizens and stakeholders to shape metaServices and metaInnovations to prepare for implementation in WP4. The methodology will include workshops and iterative refinement, ensuring stakeholder engagement throughout. LL2 workshops, conducted in physical or hybrid formats with potential online questionnaires, will refine prototype UCs, tailoring them for demonstration in each Living Lab (LL). These discussions will also address the business and governance structures, enhancing feasibility and implementation. LL3 will further engage citizens to define key characteristics of UCs and metaServices for maximum adoption, while also guiding targeted marketing strategies (for some UCs, the T-LLs have embedded LL3 activity into LL2). Each F-LL will facilitate co-creation workshops to develop comprehensive models of their smart mobility solutions, integrating user interactions, technical specifications, and operational factors. The prototypes will undergo iterative refinement based on feedback and will be harmonized across different F-LLs to ensure scalability.

4.2.2. Cross-fertilization

The cross-fertilization and transferability (CF&T) process is essential for ensuring that metaCCAZE Use Cases (UCs) and BIGMs, developed through Living Lab (LL) metadesign, can be effectively replicated in cities within and beyond the project's scope. The objective is to validate and demonstrate the resilience, adaptability, and transferability of UCs and BIGMs across diverse urban contexts and SUMP needs. The CF&T process follows five phases: metadesign, cross-fertilization, testing and transfer, implementation, and validation, with iterative activities involving both Trailblazer and Follower LLs. Starting with each LL's self-assessment of sustainability maturity, governance models, and mobility roadmaps, CF&T activities emphasize co-creation, structured knowledge exchange, and systematic transferability opportunities. Cluster Co-creation Lab 2 (CCL2), taking place in Amsterdam in February, will be the first key event facilitating this exchange. It will focus on showcasing innovative projects, fostering collaboration, and initiating UC and BIMG transferability from T-LLs to F-LLs.

The preparation of the Status Quo Map for the follower cities, gives a well-structured preliminary knowledge that allows F-LLs cities to better understand their own barriers and needs to start learning from T-LLs experiences. To measure success, Transferability

Potential Assessment (TPA) KPIs will help evaluate the development and outcomes of CF&T activities, ensuring a structured approach to achieving project objectives.

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Annexes

Annex I - Data Map Summary

The content described in the tables below depicts mobility and traffic-related data availability in the T-LLs. Mobility data (see Table 1 of this annex) encompass a broader range of metrics that include various modes of transportation, shared mobility options, infrastructure support, and innovative vehicle technologies. These data aim to measure the effectiveness, efficiency, and integration of different mobility solutions within a city. In contrast, traffic-related data (see Table 2 of this annex) focus more narrowly on specific aspects of vehicular movement and road usage. The list provided includes a wide range of metrics that can be classified as traffic data and other related transportation metrics. These metrics highlight critical areas such as traffic flow patterns, vehicle classifications, origin-destination data, traffic volume and density, average and free flow speeds, congestion levels, and queue lengths at intersections. Additionally, traffic data cover aspects of public transport data, charging infrastructure, transport network characteristics, transport technology, travel behavior, and the environmental, social, and economic impacts of transportation systems.

The data map summary for the six follower cities can be summarized as follows:

Table 1. Mobility related data

DATA TO BE PROVIDED	ATHENS	KRAKOW	GOZO	YVELINES	MISKOLC	MILAN
Percentage of trips by car, bus, bicycle, etc.	Not available	Available	Available	Available	Limited availability	Available
Average travel time between specific locations	Not available	Available	Available	Available	Not available	Collectable
Number of vehicles on highway segments	Not available	Available	Limited availability	Available	Limited availability	Collectable
Average number of passengers per vehicle	Not available	Available	Limited availability	Available	Not available	Available
LOS rating (A to F) at various locations	Not available	Limited availability	Limited availability	Not available	Not available	Collectable
Average wait time at traffic signals	Not available	Limited availability	Not available	Available	Not available	Collectable
Standard deviation of travel times	Not available	Limited availability	Available	Available	Not available	Collectable
Number of accidents per month, injuries, fatalities	Not available	Available	Available	Asked if collectable	Limited availability	Limited availability
CO2 emissions, NOx emissions, etc.	Not available	Available	Limited availability	Available	Not available	Collectable
Percentage of accurate predictions	Not available	Limited availability	Available	Not available	Limited availability	Not available
Survey ratings or feedback scores	Not available	Available	Available	Not available	Not available	Limited availability
Average turnaround time for buses	Not available	Limited availability	Limited availability	Asked if collectable	Limited availability	Collectable
Transfer time between bus and train	Not available	Limited availability	Limited availability	Asked if collectable	Limited availability	Collectable

Total revenue generated, operating expenses	Not available	Limited availability	Not available	Asked if collectable	Limited availability	Limited availability

Table 2. Traffic related data

DATA CATEGORIES	DATA VARIABLES	ATHENS	KRAKOW	GOZO	YVELINES	MISKOLC	MILAN
Traffic Data	Average Daily Traffic (ADT)	Not available	Available	Partial	Available	Limited availability	Limited availability
	Traffic Flow Patterns	Available	Limited availability	Partial	Limited availability	Not available	Limited availability
	Vehicle Types and Classifications	Not available	Not available	Partial	Available	Limited availability	Available
	Origin-Destination Data	Limited availability	Limited availability	Available	Not available	Not available	Limited availability
	Traffic Volume	Not available	Available	Partial	Available	Limited availability	Limited availability
	Traffic Density	Not available	Available	Not Available (only volume)	Not available	Limited availability	Limited availability
	Average Speed	Not available	Not available	Partial	Limited availability	Not available	Limited availability
	Free Flow Speed	Not available	Not available	Partial	Available	Not available	Limited availability
	Congestion Index	Available	Not available	Partial	Available	Not available	Limited availability
	Queue Length (Intersections / Bottlenecks)	Available	Not available	Not available	Not available	Not available	Limited availability
	Lane Utilization - Lane Capacity	Not available	Not available	Partial	Not available	Not available	Limited availability
	Delay Time	Available	Not available	Can be calculated	Available	Not available	Limited availability
	Flow Distribution	Not available	Not available	Partial	Available	Not available	Limited availability
	Peak Hour Traffic	Not available	Not available	Partial	Available	Not available	Limited availability
Public Transport Data	Ridership Statistics	Partially available	Available	Available	Asked if collectable	Limited availability	Limited availability
	Frequency and Reliability	Available	Available	Available	Asked if collectable	Limited availability	Limited availability
	Accessibility of Stops and Stations	Available	Available	Partial	Asked if collectable	Limited availability	Limited availability
Charging Infrastructure	Number and Locations of Charging Stations	Limited availability	Limited availability	Available	Available	Limited availability	Available
	Charging Capacity and Compatibility	Not available	Not available	Available	Asked if collectable	Limited availability	Available
	Utilisation Rates	Not available	Not available	Available	Asked if collectable	Not available	Not available
	Availability of Fast Charging	Not available	Not available	Available	Asked if collectable	Limited availability	Available
Transport Networ	Road Network Characteristics	Available	Limited availability	Limited availability	Available	Limited availability	Available

	Bicycle and Pedestrian Infrastructure	Available	Limited availability	Limited availability	Available	Limited availability	Available
	Freight Routes and Distribution Centers	Limited availability	Not available	Not available	Asked if collectable	Limited availability	Not available
	Public Transport Stops and Stations	Available	Available	Available	Available	Available	Available
Transport Technology	Intelligent Transport Systems (ITS)	Available	Limited availability	Not available	Asked if collectable	Limited availability	Limited availability
	Vehicle-to-Infrastructure (V2I) Communication	Limited availability	Not available	Not available	Asked if collectable	Not available	Not available
	Vehicle-to-Vehicle (V2V) Communication	Not available	Not available	Not available	Asked if collectable	Not available	Not available
	Advanced Driver Assistance Systems (ADAS)	Not available	Not available	Not available	Asked if collectable	Not available	Not available
Travel Behaviour	Travel Survey Data	Limited availability	Limited availability	Available	Asked if collectable	Limited availability	Limited availability
	Commuting Patterns	Not available	Limited availability	Available	Asked if collectable	Not available	Limited availability
	Ride-Sharing and Micromobility	Not available	Not available	Not available	Asked if collectable	Not available	Limited availability
Environmental Impact	Air Quality Monitoring Data	Not available	Not available	Available	Available	Not available	Available
	Noise Pollution Levels	Not available	Not available	Available	Available	Not available	Not available
	Greenhouse Gas Emissions Inventory	Available	Not available	Not available	Asked if collectable	Not available	Available
Social Impact	Demographic Profiles	Available	Not available	Available	Asked if collectable	Limited availability	Limited availability
	Accessibility for Vulnerable Populations	Available	Not available	Not available	Asked if collectable	Not available	Limited availability
	Public Perception Surveys	Not available	Limited availability	Available	Asked if collectable	Not available	Limited availability
Economic Impact	Transportation Expenditures	Available	Not available	Not available	Asked if collectable	Limited availability	Limited availability
	Economic Benefits of Transport Investments	Not available	Not available	Not available	Asked if collectable	Limited availability	Not available
	Cost-Benefit Analysis	Not available	Not available	Not available	Asked if collectable	Limited availability	Not available

Annex II - Data Map for each F-LL

The following pages present comprehensive data maps for six F-LL cities. Each city is analysed using the same structure to facilitate easy comparison and analysis.

For each city, a table is provided that includes data categories, specific variables, and descriptions of each variable. Detailed information is also given about the availability of data, sources, types, formats, and collection methods for each variable. Additionally, information on data access and usage restrictions, data quality, last updated dates, spatial and temporal coverage, aggregation levels, and the reliability of data sources is included.

For each city, only the information reported as “Available”, “Publicly Available”, or “Partially Available” is included in the tables below. Data marked as “Not Available” has been excluded at this stage. The need to collect such data will be evaluated in later phases of the project.

Additionally, any information not provided by the F-LLs has been marked with a “–” symbol in the table. These gaps will also be addressed in the next stage, if deemed necessary.

Athens

Table 1. Data Categories, Variables, Sources, and Quality for Athens

Data Categories	Data Variables	Description	Availability	Data Type	Data Source	Last Updated (Date)	Spatial Coverage	Data Quality	Data Collection Method	Data Coverage	Temporal Resolution	Spatial Resolution	Data Format	Data Access Restrictions	Data Aggregation Level	Data Source Reliability	Data Usage Restrictions
Traffic KPIs	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow	Available	Spatial	Google Maps	Real-time	Urban & Spatial	High	GPS Tracking (*1)	Global	Real-time	Street level	other	Open access	Aggregated by minute	Verified by third party	None
	Origin-Destination Data	Origin and destination of trips, commuter and freight traffic	Partially Available	Spatial/ Categorical	Traffic surveys, government records (*2)	other	National	High	Census data collection	National	other	Census tract-level	PDF	None	Aggregated by census	Official public transport data	None
	Congestion Index	Measure of traffic congestion level, often based on travel time compared to free-flow conditions	Available	Numeric/ Spatial	Tomtom & Google Maps	Real-time	Urban & Spatial	High	GPS Tracking	Global	Real-time	Street level	other	Open access	Aggregated by minute	Verified by third party/Official public transport data	None
	Queue Length (Intersections / Bottlenecks)	Length of vehicle queues at intersections or bottlenecks during peak hours	Available	Numeric/ Spatial	Google Maps	Real-time	Urban & Spatial	High	GPS Tracking	Global	Real-time	Street level	other	Open access	Aggregated by minute	Official public transport data	None
Electric Vehicle Fleet Chargers' Types and Specification	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Partially Available	Tabular/ Numeric	OASA/OSY	Periodically	Urban & Spatial	High	GPS tracking	Regional	Real-time	Charging station-level	Excel	None (only by OASA & 0SY)	Aggregated by project	Official transit authority	None
	Charging Schedule and Charging Stations Occupation Rates	Schedules and occupancy rates for charging stations	Available	Tabular/ Numeric	OASA/OSY	Periodically	Urban & Spatial	High	Automated sensors	Regional	Real-time	Charging station-level	other	None (only by OASA & 0SY)	Aggregated by minute	Official charging station data	None
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Available (partially available for the Electric Buses)	Numeric/ Spatial	OASA/OSY	Periodically	Urban & Spatial	High	GPS Tracking	Global	Real-time	Service area-level	other	None (only by OASA & 0SY)	Aggregated by minute	Official public transport data	None
Economic Impact	Transportation Expenditures	Costs related to transportation, fuel, maintenance	Available	Numeric	Minister of Development and Investments	Periodically	National	High	Surveys	National	Every Three Months	National Level	Excel	None	Aggregated by month	Official government	None
Energy Grid Data	Transition, distribution, renewable/conventional energy mix, energy price changes	Data on energy grid infrastructure and characteristics	Available	Numeric	Minister of Development and Investments	Periodically	National	High	Surveys	National	Every Three Months	National Level	Excel	None	Aggregated by month	Official government	None
Public Transport Services	Timetables	Timetables and schedules for public transport services	Available	Tabular/ Numeric	OASA Telematics	Periodically	Urban & Spatial	High	GPS tracking	Regional	Real-time	Lane-level	Excel	Open access	Aggregated by minute	Official transit authority	None
	Electric Vehicle Fleet Chargers' Types and Specification	Charger types and specifications for electric vehicle fleets	Available	Tabular/ Numeric	OASA/OSY	Periodically	Urban & Spatial	High	GPS tracking	Regional	Real-time	Charging station-level	Excel	None (only by OASA & 0SY)	Aggregated by project	Official transit authority	None
	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Available	Tabular/ Numeric	OASA/OSY	Periodically	Urban & Spatial	High	GPS tracking	Regional	Real-time	Charging station-level	Excel	None (only by OASA & 0SY)	Aggregated by project	Official transit authority	None
	Charging Schedule and Charging	Schedules and occupancy rates for charging stations	Available	Tabular/ Numeric	OASA/OSY	Periodically	Urban & Spatial	High	Automated sensors	Regional	Real-time	Charging station-level	other	None (only by OASA & 0SY)	Aggregated by minute	Official charging	None

	Stations Occupation Rates															station data	
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles	Available	Textual	OASA/OSY	Periodically	Urban & Spatial	High	other	Regional	Decennial	Vehicle-level	PDF	Open access	Aggregated by project	Official transit authority	None
	Public Transport Ticketing Data	Data related to ticketing and fare collection on public transport	Available	Tabular/ Numeric	OASA Telematics	Periodically	Urban & Spatial	High	Census data collection	Regional	Real-time	Lane-level	Excel	Open access	Aggregated by census	Official public transport data	None
	Existing Origin-Destination Analyses	Analyses of existing trip origins and destinations	Partially Available (*2)	Tabular/ Numeric	OASA Telematics	Periodically	Urban & Spatial	High	GPS tracking	Regional	Real-time	Neighborhood-level	Excel	Open access	Aggregated by project	Official public transport data	None
	Average Speed for Vehicles in Urban Environment	Average speed of vehicles in the urban environment	Available	Numeric/ Spatial/ Categorical	Tomtom & OSM	Periodically	Global	High	GPS Tracking	Global	Real-time	Street level	other	Open access	other	Verified by third party	None
	Road Service Status	Information on road conditions, maintenance, and construction	Available	Spatial	Google Maps	Real-time	Global	High	GPS Tracking	Global	Real-time	Street level	other	Open access	Aggregated by minute	Verified by third party	None
	Speed Regulations for the Road Network	Legal speed limits and regulations for road traffic	Available	Numeric/ Spatial/ Categorical	Department of Transport	Periodically	Global	High	other	Global	other	Street level	PDF	Open access	other	Verified by third party	None
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Available (partially available for the Electric Buses)	Numeric/ Spatial	OASA/OSY	Periodically	Urban & Spatial	High	GPS Tracking	Global	Real-time	Service area-level	other	None (only by OASA & 0SY)	Aggregated by minute	Official public transport data	None

*(*1) based on trip data anonymously collected from drivers within the larger metropolitan area ("metro") throughout the complete road network — including fast roads and highways crossing this area.*

*(*2) A research by OASA is being conducted considering these aspects. The modal choice is available from the SUMP of Athens 2021)*

(-) Information not known

Krakow

Table 2. Data Categories, Variables, Sources, and Quality for Krakow

Data Categories	Data Variables	Description	Availability	Data Type	Data Source	Last Updated (Date)	Spatial Coverage	Data Quality	Data Collection Method	Data Coverage	Temporal Resolution	Spatial Resolution	Data Format	Data Access Restrictions	Data Aggregation Level	Data Source Reliability	Data Usage Restrictions
Traffic KPIs	Average Daily Traffic (ADT)	Number of vehicles passing through a specific location on a road or highway within a day	Limited availability	Tabular	Traffic counters, sensors	Real-time	Local (Urban: intersections)	High	Automated sensors	-	Real-time	Intersection-level	csv	Internal data on request	15min	Official government	None
	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow	Limited availability	Tabular	Traffic counters, sensors	Real-time	Local (Urban: intersections)	High	Automated sensors	-	Real-time	Intersection-level	csv	Internal data on request	15min	Official government	None
	Origin-Destination Data	Origin and destination of trips, commuter and freight traffic	Limited availability	Textual	Traffic surveys, government records	2023	Metropolitan	Medium	Manual surveys	-	-	Metropolitan	PDF	Surveys in report form available on public website	Aggregated by time of traffic survey	Official government	None
	Traffic Volume	Number of vehicles passing through a specific	Limited availability	Tabular	Traffic counters, sensors	Real-time	Local (Urban:	High	Automated sensors	-	Real-time	Intersection-level	csv	Internal data on request	15min	Official government	None

		point or section of road within a given time frame					intersections)										
	Traffic Density	Measure of vehicle concentration per unit length of road	Limited availability	Tabular	Traffic counters, sensors	Real-time	Local (Urban: intersections)	High	Automated sensors	-	Real-time	Intersection-level	csv	Internal data on request	15min	Official government	None
	Average Speed	Mean speed of vehicles along a road segment or corridor	Limited availability	Tabular	Traffic modeling data	Data must be processed on the basis of available input data	Corridor-level	Medium	Traffic flow simulations	-	-	Corridor-level	csv	Internal data on request	15min	Official government	None
	Free Flow Speed	Speed vehicles would travel at under ideal conditions, unaffected by congestion	Limited availability	Tabular	Traffic modeling data	Data must be processed on the basis of available input data	Corridor-level	Medium	Traffic flow simulations	-	-	Corridor-level	csv	Internal data on request	15min	Official government	None
	Congestion Index	Measure of traffic congestion level, often based on travel time compared to free-flow conditions	Limited availability	Tabular	Traffic modeling data	Data must be processed on the basis of available input data	Corridor-level	Medium	Traffic flow simulations	-	-	Corridor-level	csv	Internal data on request	15min	Official government	None
	Queue Length (Intersections / Bottlenecks)	Length of vehicle queues at intersections or bottlenecks during peak hours	Limited availability	Tabular	Traffic modeling data	Data must be processed on the basis of available input data	Corridor-level	Medium	Traffic flow simulations	-	-	Corridor-level	csv	Internal data on request	15min	Official government	None
	Peak Hour Traffic	Traffic volume and flow patterns during peak hours of the day	Limited availability	Tabular	Traffic modeling data	Data must be processed on the basis of available input data	Corridor-level	Medium	Traffic flow simulations	-	-	Corridor-level	csv	Internal data on request	15min	Official government	None
Transport Network	Road Network Characteristics	Lane widths, speed limits, classifications	Publicly available/ Limited availability	Spatial Tabular	Traffic management agencies	Periodically	Local	Medium	-	-	-	-	-	Open access Internal data on request	-	Official government	None
	Bicycle and Pedestrian Infrastructure	Availability of bike lanes, sidewalks, crosswalks	Publicly available	Spatial	Department of Transport website Traffic management agencies	Periodically	Local	High	Manual	-	-	Local - level	-	Open access	-	Official public transport data	None
Electric Vehicle Fleet Chargers' Types and Specification	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Publicly available	Spatial	EV charging network databases	Periodically	National	Medium	-	-	-	National level	-	-	-	Official government	None
	Weather Data	Meteorological data including temperature, precipitation, etc.	Publicly available	Tabular	Meteorological agencies	Open access	-	-	Automated sensors	-	Daily	National level	csv	Open access	-	Online mapping services	None
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Limited availability for P+R parking	Sriritaual	Department of Transport website Traffic management agencies	-	-	-	-	-	-	-	-	-	-	-	-
Intersection Management	Intersection Management	Management strategies and data for traffic intersections	Limited availability	Sriritaual Textual	Traffic organization designs for roads	Periodically	Local	High	-	-	-	-	pdf	Internal data on request Traffic organization designs for roads	-	Official government	None
Environmental Impact	Air Quality Monitoring Data	Pollutant concentrations, emissions	Publicly available	Spatial	Environmental monitoring agencies	By hour	National	High	Automated sensors	-	Hourly	National level		Online mapping services	-	Official government	None
Energy Grid Data	Transition, distribution, renewable/conventional energy mix, energy price changes	Data on energy grid infrastructure and characteristics	Publicly available	Tabular	State-owned company that manages the National Electricity System	Real-time	National	High	Automated sensors	-	Real-time	National level	csv	Open access	15min	Online mapping services	None

Public Transport Services	Timetables	Timetables and schedules for public transport services	Publicly available	Tabular	Department of Transport website	Daily	Local	High	Manual	-	Daily	National level	pdf	Open access	1min	Online mapping services	None
	Electric Vehicle Fleet Chargers' Types and Specification	Charger types and specifications for electric vehicle fleets	Limited availability	Textual	Transport department records	-	-	-	-	-	-	-	-	Internal data on request	-	-	-
	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Limited availability	Textual	Transport department records	-	-	-	-	-	-	-	-	Internal data on request	-	-	-
	Charging Schedule and Charging Stations Occupation Rates	Schedules and occupancy rates for charging stations	Limited availability	Textual	Transport department records	-	-	-	-	-	-	-	-	Internal data on request	-	-	-
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles	Limited availability	Textual	Transport department records	-	-	-	-	-	-	-	-	Internal data on request	-	-	-
	Weather Data	Meteorological data including temperature, precipitation, etc.	Publicly available	Tabular	Meteorological agencies	Real-time	National	High	Automated sensors	-	Hourl y	National level	csv	Open access	-	Online mapping services	None
	Road Service Status	Information on road conditions, maintenance, and construction	Limited availability	Textual	Traffic management agencies	Periodically	Local	Medium	Manual	-	-	Local - level	pdf	Internal data on request	-	Official government	None
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Limited availability for P+R parking	Sriritaual	Department of Transport website	Real-time	-	-	-	-	-	-	-	Online mapping services	-	-	None
	Intersection Management	Management strategies and data for traffic intersections	Limited availability	Sriritaual Textual	Traffic organization designs for roads	Periodically	Local	High	-	-	-	-	pdf	Internal data on request Traffic organization designs for roads	-	Official government	None
	Curbside Information for the Urban Environment	GIS data related to curbside management in urban areas	Publicly available	Sriritaual	Online mapping services	Periodically	Local	Medium	-	-	-	-	csv	-	-	Official government	None
	Demand for On-demand Mobility Services	Data on demand for on-demand mobility services	Limited availability	Tabular	Transport department records	Periodically	Local	High	Data from the service provider	Local	Daily	Service area-level	csv	None	Monthly	Official government	None

(-) Information not known

Gozo-Malta

Table 3. Data Categories, Variables, Sources, and Quality for Gozo-Malta

Data Categ ories	Data Variables	Description	Availabili ty	Data Type	Data Source	Last Updated (Date)	Spatial Coverage	Data Quality	Data Collection Method	Data Coverage	Tempor al Resolut ion	Spatial Resolut ion	Data Format	Data Access Restrictions	Data Aggreg ation Level	Data Sourc e Relia bility	Data Usage Restrictions
Traffi c KPIs	Average Daily Traffic (ADT)	Number of vehicles passing through a specific location on a road or highway within a day	Partial Available (not all road classes)	spatial, numeric	Transport Authority	Baseyear 2021 (Developed 2023)	Data Available of Arterial, Distributor, Local Access Roads	High	Modelled (validated by counts)	-	Peak Hour	National Level	GIS (shp, geojson, etc)	Network for available road classes to be provided	Static - peak hour	High	To be used for this project, any further use upon request.

	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow	Partial Available (not all road classes)	spatial, numeric	Transport Authority	Baseyear 2021 (Developed 2023)	Data Available of Arterial, Distributor, Local Access Roads	High	Modelled (validated by counts)	-	Peak Hour	National Level	GIS (shp, geojson, etc)	Network for available road classes to be provided	Static - peak hour	High	To be used for this project, any further use upon request.
	Vehicle Types and Classifications	Distribution of vehicle types (e.g., cars, trucks, buses, bicycles)	Partial Available (not all road classes)	spatial, numeric	Transport Authority	Baseyear 2021 (Developed 2023)	Data Available of Arterial, Distributor, Local Access Roads	High	Modelled (validated by counts)	-	Peak Hour	National Level	GIS (shp, geojson, etc)	Network for available road classes to be provided	Static - peak hour	High	To be used for this project, any further use upon request.
	Origin-Destination Data	Origin and destination of trips, commuter and freight traffic	Available	numeric	Transport Authority	Baseyear 2021 (Developed 2023)	National	Medium	Modelled	-	Peak Hour	National : 199 zones of NTM	.xls	Can be provided upon request	Static - peak hour	Medium	To be used for this project, any further use upon request.
	Traffic Volume	Number of vehicles passing through a specific point or section of road within a given time frame	Partial Available (not all road classes)	spatial, numeric	Transport Authority	Baseyear 2021 (Developed 2023)	Data Available of Arterial, Distributor, Local Access Roads	High	Modelled (validated by counts)	-	Peak Hour	National Level	GIS (shp, geojson, etc)	Network for available road classes to be provided	Static - peak hour	High	To be used for this project, any further use upon request.
	Average Speed	Mean speed of vehicles along a road segment or corridor	Partial Available (not all road classes)	spatial, numeric	Transport Authority	Baseyear 2021 (Developed 2023)	Data Available of Arterial, Distributor, Local Access Roads	High	Modelled (validated by counts)	-	Peak Hour	National Level	GIS (shp, geojson, etc)	Network for available road classes to be provided	Static - peak hour	High	To be used for this project, any further use upon request.
	Free Flow Speed	Speed vehicles would travel at under ideal conditions, unaffected by congestion	Partial Available (not all road classes)	spatial, numeric	Transport Authority	Baseyear 2021 (Developed 2023)	Data Available of Arterial, Distributor, Local Access Roads	High	Modelled (validated by counts)	-	Peak Hour	National Level	GIS (shp, geojson, etc)	Network for available road classes to be provided	Static - peak hour	High	To be used for this project, any further use upon request.
	Congestion Index	Measure of traffic congestion level, often based on travel time compared to free-flow conditions	Partial Available (not all road classes)	spatial, numeric	Transport Authority	Baseyear 2021 (Developed 2023)	Data Available of Arterial, Distributor, Local Access Roads	High	Modelled (validated by counts)	-	Peak Hour	National Level	GIS (shp, geojson, etc)	Network for available road classes to be provided	Static - peak hour	High	To be used for this project, any further use upon request.
	Peak Hour Traffic	Traffic volume and flow patterns during peak hours of the day	Partial Available (not all road classes)	spatial, numeric	Transport Authority	Baseyear 2021 (Developed 2023)	Data Available of Arterial, Distributor, Local Access Roads	High	Modelled (validated by counts)	-	Peak Hour	National Level	GIS (shp, geojson, etc)	Network for available road classes to be provided	Static - peak hour	High	To be used for this project, any further use upon request.
Transport Network	Road Network Characteristics	Lane widths, speed limits, classifications	Limited availability	Numeric	Department of Transport website	Periodically	National	High	GIS mapping	other	Project-based	Street-level	JSON	Restricted access	Aggregated by project	Official government	License agreement
	Bicycle and Pedestrian Infrastructure	Availability of bike lanes, sidewalks, crosswalks	Limited availability	Numeric	Department of Transport website	Periodically	National	High	GIS mapping	other	Project-based	Street-level	JSON	Restricted access	Aggregated by project	Official gover	License agreement

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Public Transport Services	Timetables	Timetables and schedules for public transport services	Available	spatial, numeric	Public Transport Operator	Real-time	Global	High	Automated data extraction	-	Real-time	Other	GTFS (CSV included)	Internal data on request	other	Official public transport data	Internal data on request
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles	Available	spatial, numeric	Public Transport Operator	Real-time	Fleet	High	other	-	Real-time	Vehicle-level	Excel, PDF	Internal data on request	N/A	Official public transport data	Internal data on request
	Public Transport Ticketing Data	Data related to ticketing and fare collection on public transport	Available	numeric	Public Transport Operator	Every day	Fleet, Global	High	Automated data extraction	-	Daily	Service area-level	Excel	Internal data on request	Aggregated by day	Official public transport data	Internal data on request
	Existing Origin-Destination Analyses	Analyses of existing trip origins and destinations	Available	spatial, numeric	Public Transport Operator	23-Jun	Fleet, Global	High	Manual surveys	-	Other	Service area-level	PDF	Internal data on request	N/A	Official public transport data	Internal data on request
	Average Speed for Vehicles in Urban Environment	Average speed of vehicles in the urban environment	Available (Buses)	spatial, numeric	Public Transport Operator	Periodically	Fleet	Medium	other	-	Monthly	Vehicle-level	Excel	Internal data on request	N/A	Official public transport data	Internal data on request
	Speed Regulations for the Road Network	Legal speed limits and regulations for road traffic	Available	textual, legal notice	Online Law Courts	Unknown	National	High	Legal Notice	-	-	National Level	Textual	Open Access	N/A	Official government	None
	Demand for On-demand Mobility Services	Data on demand for on-demand mobility services	Available	spatial, numeric	Public Transport Operator	Periodically	Regional	High	Automated data extraction	-	other	Service area-level	Excel	Internal data on request	N/A	Official public transport data	Internal data on request
	Ridership Statistics	Number of passengers using public transit services	Available	spatial, numeric	Public Transport Operator	Every day	Fleet, Global	High	Automated data extraction		Daily	Service area-level	Excel	Internal data on request	N/A	Official public transport data	Internal data on request
	Frequency and Reliability	Frequency of public transit services and reliability	Available	spatial, numeric	Public Transport Operator	Every day	Fleet, Global	High	other	-	Daily	Service area-level	Excel	Internal data on request	Aggregated by day	Official public transport data	Internal data on request
	Accessibility of Stops and Stations	Availability and accessibility of public transit stops and stations	Partial Available	spatial	Google	Unknown	National	Unknown	Google	National	-	National Level	KML	Google	unknown	Google	Google
	General Transit Feed Specification (GTFS) data, telematics, or other static data	Timetables and schedules for public transport services	Available	spatial, numeric	Public Transport Operator	Every day	Fleet, Global	High	Automated data extraction	-	Real-time	Service area-level	Excel	Internal data on request	N/A	Official public transp	Internal data on request

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Environmental Impact	Air Quality Monitoring Data	Pollutant concentrations, emissions	Publicly Available	Spatial / Tabular	Air pollutant concentrations (*1)	2023 Most are Real-time (15mins) Others daily or weekly	National	High	Emissions monitoring	5 stations acros both islands	Weekly (*5)	Station-level	Excel	None	Aggregated by hour,day, year	Official government	None
	Noise Pollution Levels	Levels of noise pollution along transport corridors	Publicly Available	Spatial / Tabular	National Transport Model, TM - traffic flows, speed. (*2)	2021, annual average	National	High	Modelling	National Transport Network - Major roads (*4)	Annual (available every 5 years)	street-level, (data also available per building)	shp files (noise contours and levels), excel files (exposure assessment)	None	Year	Official government	None
	Greenhouse Gas Emissions Inventory *1	Emissions from transport sources	Publicly Available	Tabluar	Air emissions in kilotonnes (*3)	2024 for years 1990-2022	National	High	Other. Multiple sources and then we model and estimate emissions	entire land territory	Annual	National level	Excel	None - we can only present results not provide activity data	year	Official government	None
Electric Vehicle Fleet Chargers'	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Publicly Available	numerical and spatial	Energy and Water Agency	2024	National	High	Geodata		Biennial	Biennial	Excel	Open Data Portal	Aggregated by survey	Official government	Open Data Portal
	Charging Schedule and Charging Stations Occupation Rates	Schedules and occupancy rates for charging stations	Partially Available *2	numerical	Contracted Operator	n/a	National	Medium	Statistics		Static		csv	Upon Request	Aggregated by project	other - network management system	Upon Request

(1)* in ug/m3 (NO, NO2, SO2,O3, CO, PM10, PM2.5, BTEX, Hg, As, Cd, Ni, Pb, elemental and organic carbon, PAHs, 8 ions)

(2)* Data provided as 5dB contour bands for Lden and Lnight noise indicator, including population exposed, area in Km2, dwellings, schools and hospitals exposed.

(3)* for NOx, Sox, PM10, PM2.5, NMVOC, NH3, BC, heavy metals, PAHs from a number of sectors including; energy, indsutry, waste and agriculture

(4)* (>3m vehicle passages per year) across Malta and Major and non-major roads within the agglomeration boundary

(5)* (PAHs) / Daily (ions, elemental and organic carbon and heavy metals, PM10/2.5) / Real-time (rest of pollutants)

(-) Information not known

Milan

Table 4. Data Categories, Variables, Sources, and Quality for Milan

Data Categories	Data Variables	Description	Availability	Data Type	Data Source	Spatial Coverage	Data Quality	Data Collection Method	Data Coverage	Temporal Resolution	Spatial Resolution	Data Format	Data Access Restrictions	Data Aggregation Level	Data Source Reliability	Data Usage Restrictions
Traffic Data	KM driven	*Variation of km driven by car by the passengers, thanks to the pilot case*	Publicly Available	Tabular	Survey	Project scale	Medium	Field surveys	Project scale	Project-based	Project-level	CSV	Open access	Aggregated by day	other	None
Transport Technology	Vehicle-to-Vehicle (V2V) Communication	Communication technologies between vehicles *(numb of communications per day)*	Limited Availability	Tabular	Project partner	Vehicle-specific	High	Manual surveys	Vehicle-specific	Project-based	Project-level	CSV	Open access	Aggregated by project	other	None

	Advanced Driver Assistance Systems (ADAS)	Adoption and prevalence of ADAS technologies	Limited Availability	Textual	Project partner	Vehicle-specific	High	Manual surveys	Vehicle-specific	Project-based	Project-level	CSV	Open access	Aggregated by project	other	None
Environmental Impact	Air Quality Monitoring Data	*Variation of air pollution emissions by type and source, thanks to the pilot.*	Publicly Available	Tabular	Survey	Project scale	Medium	Field surveys	Project scale	Project-based	Project-level	CSV	Open access	Aggregated by day	other	None
Economic Impact	Transportation Expenditures	Costs related to transportation, fuel, maintenance *(change for average passenger)*	Publicly Available	Tabular	Project partner	Project scale	Low	Manual surveys	Project scale	Project-based	Project-level	CSV	Open access	Aggregated by project	other	None
	Economic Benefits of Transport Investments	Job creation, business growth resulting from investments	Publicly Available	Textual	Project partner	other	Low	other	other	Project-based	Project-level	PDF	Open access	Aggregated by project	other	None
	Cost-Benefit Analysis	Costs and benefits associated with transport projects	Publicly Available	Textual	Project partner	other	Low	other	other	Project-based	Project-level	PDF	Open access	Aggregated by project	other	None
Energy Grid Data	Transition, distribution, renewable/conventional energy mix, energy price changes	*Variation of energy consumed and type, thanks to the pilot.*	Publicly Available	Tabular	Survey	Project scale	Medium	Field surveys	Project scale	Project-based	Project-level	CSV	Open access	Aggregated by day	other	None
Public Transport Services	Demand for On-demand Mobility Services	Data on demand for on-demand mobility services	Limited Availability	Tabular	Project partner	Project scale	High	Automated counts	Project scale	Hourly	Project-level	CSV	Open access	Aggregated by hour	Official transit authority	None
Passengers behaviour		*Change in travel time of commuting*	Publicly Available	Tabular	Survey	Project scale	Medium	Field surveys	Project scale	Project-based	Project-level	CSV	Open access	Aggregated by day	other	None

Miskolc

Table 5. Data Categories, Variables, Sources, and Quality for Miskolc

Data Categories	Data Variables	Description	Availability	Data Type	Data Source	Last Updated (Date)	Spatial Coverage	Data Quality	Data Collection Method	Data Coverage	Temporal Resolution	Spatial Resolution	Data Format	Data Access Restrictions	Data Aggregation Level	Data Source Reliability	Data Usage Restrictions
Traffic KPIs	Average Daily Traffic (ADT)	Number of vehicles passing through a specific location on a road or highway within a day	Limited Availability	Numeric	Traffic management agencies	Annual	Local urban intersections	Medium	Automated counts	-	Daily	Roadsegment	pdf	open access	Day	official transit authority	-
	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow	Limited Availability	Textual	Transport department records	2016	Citywide	Low	Survey questionnairs	-	Project based	Citywide	pdf	open access	Day	other	-
	Vehicle Types and Classifications	Distribution of vehicle types (e.g., cars, trucks, buses, bicycles)	Limited Availability	Numeric	Traffic management agencies	Annual	Citywide	High	Census data	-	Yearly	Citywide	other	open access	Year	official census data	-
Electric Vehicle Fleet Chargers' Types and Specification	Number and Locations of Chargers	Count and geographical distribution of EV charging stations	Limited Availability	Spatial	EV charging network databases	Periodically	Nationwide	Medium	GIS mapping	-	Real-time	Charging-station level	other	none	-	other	-
	Weather Data	Meteorological data including temperature, precipitation, etc.	Limited Availability	Spatial	Meteorological agencies	Real-time	National	High	Automated sensors, simulation models	-	Real-time	Sector	other	none	-	official government	-
	Parking Data / Parking e-Smart Data	Information on parking availability, occupancy, and payment	Limited Availability	Spatial	Transport department records	Monthly	Citywide	Medium	Automated counts	-	Daily	Sector	pdf	none	-	other	-
Public Transport Services	Timetables	Timetables and schedules for public transport services	Publicly Available	Tabular	Transit schedule data	Real-time	Citywide	High	Other	-	Real-time	Citywide	Excel	open access	-	official public	-

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	Electric Vehicle Fleet Chargers' Types and Specification	Charger types and specifications for electric vehicle fleets	Limited Availability	Tabular	Transit schedule data	Real-time	Local urban intersections	High	Other	-	Real-time	Charging-station level	other	none	-	other	-
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles	Limited Availability	Tabular	Transit authority reports	Monthly	Citywide	High	Other	-	Monthly	Citywide	Excel	none	-	official transit authority	-
	Public Transport Ticketing Data	Data related to ticketing and fare collection on public transport	Limited Availability	Tabular	Transit authority reports	Monthly	Citywide	High	Automated counts	-	Monthly	Citywide	Excel	none	-	official transit authority	-
	Intersection Management	Management strategies and data for traffic intersections	Limited Availability	Spatial	Transit schedule data	Real-time	Citywide	Medium	Other	-	Real-time	Citywide	other	none	-	other	-

(-) Information not known

Yvelines

Table 6. Data Categories, Variables, Sources, and Quality for Yvelines

Data Categories	Data Variables	Description	Availability	Plan To collect	Data Type	Data Source	Last Updated (Date)	Spatial Coverage	Data Quality	Data Collection Method	Data Coverage	Temporal Resolution	Spatial Resolution	Data Format	Data Access Restrictions	Data Aggregation Level	Data Source Reliability	Data Usage Restrictions
Traffic KPIs	Average Daily Traffic (ADT)	Number of vehicles passing through a specific location on a road or highway within a day - SIG du Département	Available	Yes	Numeric	Counting station	Periodically	Departemental roads	High	Automated sensors	yearly	quarterly	Specific points	N.a	Open access	by year	Official	None
	Traffic Flow Patterns	Peak hours, congestion hotspots, directional flow - Modèle de trafic édité par une entreprise prestataire du Département	Available	Yes	tabular	Traffic modeling data	2023	Neighbourhood	High	Automated Sensors / Human counting	daily	Peak hour	Road	pdf	Yes - the model belongs to a company	by survey	traffic-specialized company	Yes
	Vehicle Types and Classifications	Distribution of vehicle types (e.g., cars, trucks, buses, bicycles) - Comptages et boucles SIREDO	Available	Yes	Numeric	Counting station	Periodically	Departemental roads	High	Automated sensors	daily	daily	Specific points	N.a	Yes - to be resquested	by survey	Official	None
	Traffic Volume	Number of vehicles passing through a specific point or section of road within a given time frame - Comptage et boucles SIREDO	Available	Yes	Numeric	Counting station	Periodically	Departemental roads	High	Automated sensors	yearly	quarterly	Specific points	N.a	Yes - to be resquested	by year	Official	None
	Free Flow Speed	Speed vehicles would travel at under ideal conditions, unaffected by congestion - Simulation GOOGLE MAPS	Available	Yes	Other	Google Maps	real-time	global	High	N.a	N.a	N.a	N.a	N.a	N.a	N.a	N.a	N.a
	Congestion Index	Measure of traffic congestion level, often based on travel time compared to free-flow conditions - Modèle de trafic	Available	Yes	Maps	traffic modeling data	2023	Neighbourhood	High	Automated Sensors / Human counting	N.a	Peak hour	Road	pdf	Yes - the model belongs to a company	by survey	traffic-specialized company	Yes
	Peak Hour Traffic	Traffic volume and flow patterns during peak hours of the day	Available	Yes	Maps	traffic modeling data	2023	Neighbourhood	High	Automated Sensors / Human counting	N.a	Peak hour	Road	pdf	Yes - the model belongs to a company	by survey	traffic-specialized company	Yes
Transport Network	Road Network	Lane widths, speed limits, classifications	Available	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Characteristics																	
Electric Vehicle Fleet Chargers' Types and Specification	Number and Locations of Chargers	Count and geographical distribution of EV charging stations - site https://alize-map.azurewebsites.net/seymaborne	Available	No	Map	Company website	unknown	Country	High	unknown	unknown	unknown	specific points	other	No	unknown	Company in charge	No
	Weather Data	Meteorological data including temperature, precipitation, etc.	Available	Yes	Numeric	open source	unknown	-	-	-	-	-	-	-	-	-	-	-
Intersection Management	Intersection Management	Management strategies and data for traffic intersections - Matrice de feux pour les carrefours des routes départementales	Available	Yes	Matrix	Department	Variable	Departmental roads	High		unknwon	Traffic light cycle	Intersections	pdf	Yes - to be requested	-	Official	No
-Public Transport Services	Timetables	Timetables and schedules for public transport services https://me-deplacer.iledefrance-mobilites.fr/fiches-horaires/train	Available	Yes	Tabular	Transportation	Periodically	Regional	High	other	-	daily	point-level	pdf	open acces	-	Official	no
	Number and Locations of Chargers	Count and geographical distribution of EV charging stations same informations than line 15	Available	Yes	Tabular	Transportation	unknown	Study area	High	unknown	Study area	daily	point-level	N.a	estimation	-	-	no
	Public Transport Fleet Specification	Specifications of public transport fleet vehicles Need to be asked to the transport company - no informations now	Available	Yes	Tabular	Transportation	unknown	Study area	High	unknown	Study area	daily	point-level	N.a	estimation	-	-	no
	Average Speed for Vehicles in Urban Environment	Average speed of vehicles in the urban environment Need to be asked to the transport company - no informations now	Available	Yes	Tabular	Transportation	unknown	Study area	High	sensors	Study area	hourly	Road and point level	N.a	estimation by sensors	-	-	no
	Speed Regulations for the Road Network	Legal speed limits and regulations for road traffic	Available	Yes	Tabular	Transportation	unknown	Study area	High	sensors	Study area	daily	Road	N.a	Open access	-	-	-

(-) Information not known

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