Project deliverable D4.1

Inception Report

Co-funded by
the European Union

Document information

Summary					
Grant Agreement	101123520	**Project short name**	deployEMDS		
Deliverable no.	D4.1	**Deliverable Name**	Inception Report		
Status	Final	**Due**	M4/5	**Date**	15/03/2024
Author(s)	Stefanie Federl, Lucie Kirstein, Nasim Kroegel, Josefine Morgan, Christopher Newman				
Dissemination level	PU				
Document history	**Version**	**Date**			
	V1.0	15/03/2024			

Legal Disclaimer

Table of Contents

List of Tables

List of Figures

List of abbreviations and acronyms

Acronym	
DG CNECT	Directorate General for Communications Networks, Content and Technology
DIGITAL	Digital Europe Programme
DRT	Demand-Responsive Transit
EC	European Commission
MaaS	Mobility-as-a-Service
NAP	National Access Point
ODT	On-demand transport
PSO	Project Security Officer
SAB	Security Advisory Board
SUMI	Sustainable Urban Mobility Indicators
WP	Work Package

1 Introduction

1.1 Context and purpose of the inception report

The establishment of a common European mobility data space (EMDS) aims to accelerate the digital and green transformation of the European mobility and transport sector. The deployEMDS project contributes to the further development of the common European mobility data space announced in the European Strategy for Data and the Sustainable and Smart Mobility Strategy[1]. It builds on PrepDSpace4Mobility[2], a Coordination and Support Action funded under the Digital Europe Programme and is the first deployment action foreseen under the EMDS initiative. The European Commission outlined its proposed way forward in its Communication on the creation of a common European mobility data space[3].

The deployEMDS project will help advance EU policy priorities in several ways. First, the project contributes to the European Strategy for Data's goal to "facilitate access, pooling and sharing of data from existing and future transport and mobility databases" by developing a technical infrastructure for an operational data space in the transport and mobility sector, based on the respective requirements and needs of local implementation projects. Second, by facilitating the availability, sharing, and reuse of data for sustainable urban mobility indicators (SUMI), the project contributes to the European Green Deal's target to accelerate "the shift to sustainable and smart mobility" as well as to achieve a 90% reduction in greenhouse gas emissions from transport by 2050. In line with this ambition, the project also contributes to the related Sustainable and Smart Mobility Strategy and its aim to "make sustainable alternatives widely available in a multimodal transport system." Finally, the project supports the aims of the Intelligent Transport Systems (ITS) Directive[4] of providing "innovative services relating to different modes of transport and traffic management", the Delegated Regulation on EU-wide multimodal travel information services (MMTIS)[5], as well as the ongoing work with the initiative on Multimodal Digital Mobility Services (MDMS)[6] and its objective of "increasing the deployment and operational use of digital mobility services within and across passenger transport modes."

The project consortium is composed of geographically diverse and interdisciplinary partners who are pooling their knowledge, resources, and strong expertise in the realms of data spaces, transport and mobility. By

[1] European Commission. (2020). Sustainable and Smart Mobility Strategy – putting European transport on track for the future, COM(2020) 789 final. [Online]. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0789

[2] PrepDSpace4Mobility (2023). [Online]. Retrieved from https://mobilitydataspace-csa.eu/.

[3] European Commission. (2023). Communication on the creation of a common European mobility data space, COM/2023/751 final. [Online]. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2023%3A751%3AFIN

[4] Directive (EU) 2023/2661 of the European Parliament and of the Council of 22 November 2023 amending Directive 2010/40/EU on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport. [Online]. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202302661

[5] European Commission. (2017). Commission Delegated Regulation (EU) 2017/1926 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide multimodal travel information services. [Online]. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32017R1926

[6] Multimodal digital mobility services. [Online]. Retrieved from https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13133-Multimodal-digital-mobility-services_en

means of real-life implementation of 16 use cases in nine cities and regions across Europe, the project will support the creation and deployment of an operational data space based on a common technical infrastructure combined with governance mechanisms. Project participants aim to make relevant data available and accessible in machine-readable format and to share these data in a controlled, simple and secure way. The use cases will contribute to the development of innovative services and applications and support policymaking by facilitating the sharing and reuse data for traffic and travel information in urban and regional areas and sustainable urban mobility indicators (SUMI)[7]. Consequently, the project will contribute to building a European ecosystem of data providers and users adopting common building blocks in the mobility domain.

The goal of this inception report is to offer a comprehensive overview of the deployEMDS project, including its scope, objectives and implementation approach. This involves outlining the project plan, detailing stakeholder engagement strategies and presenting project management methodologies. Additionally, the inception report presents a thorough risk assessment, highlighting potential challenges and proposing preliminary mitigation strategies, along with the monitoring and evaluation framework. Finally, it offers a clear understanding of the project's inception by depicting the current state of the technical and the legal environment as well as the implementation projects.

[7] The revised TEN-T Regulation entering into force mid-2024 foresees an Implementing Act planned for the second half of 2025. The implementing act will include the methodology for collecting and calculating data for the sustainable urban mobility indicators (SUMI).

2 Project overview

2.1 Project objectives and scope

The objectives and activities of the deployEMDS project contribute to the overall objective described in the Digital Europe Programme to reinforce "EU critical digital capacities" in the key area of "data infrastructure, governance, and processing" to support the European Union's "digital open strategic autonomy".[8] deployEMDS builds on the preparatory action PrepDSpace4Mobility funded under the Digital Europe Programme (see objective 4 below) and supports "the deployment of the actual data spaces in line with the common architectural requirements".[9]

Objectives

deployEMDS has one general objective (O1):

O1: "Contribute to the further development of the common European mobility data space announced in the Data Strategy and the Sustainable and Smart Mobility Strategy, built and operated in full compliance with existing EU legislation in the mobility and transport sectors."

Furthermore, the project has 2 specific objectives (O2, O3) and 3 cross-cutting objectives (O4, O5, and O6):

O2: "Support the creation and deployment through real-life implementation projects of a technical infrastructure combined with governance mechanisms that will facilitate easy access to and sharing of key data resources in this area, including across borders."

O2 has two sub-objectives:

O2.1: Focus on the "real-world deployment of data space building blocks through use cases based on mobility data sharing."

O2.2: Accompany the use cases through "activities related to the digitalisation of processes in order to implement data space building blocks, make data available for the use cases and make sure that future updates are made digitally."

O3: "Contribute to the development of innovative services and applications and support policymaking by helping make available, share and reuse data for sustainable urban mobility indicators (SUMI) and for traffic and travel information in urban and regional areas."

O3 has three sub-objectives:

O3.1: "Deploy an operational data space allowing participants to make data available and accessible in a machine-readable format, and to share data in a controlled, simple, and secure way."

[8] European Commission. (2021): *Digital Europe Work Programme 2021-2022*, p.3.
[9] European Commission. (2021): *Digital Europe Work Programme 2021-2022*, p. 36.

O3.2: “Support sustainable urban mobility planning and management and enable innovative services and applications by making data available and accessible in machine-readable format for EU sustainable urban mobility indicators, such as greenhouse gas emissions, congestion, road safety, commuting travel times, and modal split in line with the EU definition and methodology.”

O3.3: “Make traffic and travel information available and accessible at urban level in a machine-readable format, in line with the Intelligent Transport Systems (ITS) Directive 2010/40/EU and, in particular, the Delegated Regulation (EU) 2015/962 on real-time traffic information services (and the revised version 2022/670 which will apply from 2025) and Delegated Regulation (EU) 2017/1926 on multimodal travel information services (and the revised version 2024/490).”

O4: “Take into account the work of the preparatory action for the data space for mobility under the first call of DIGITAL and use as much as possible the common building blocks identified by this action.”

O5: “Fully comply with the European Data Spaces Technical Framework. To profit from and use the smart middleware platform and tools that will be developed under topic 2.1.1. of the DIGITAL Work Programme 2021-2022.”

O6: Communicate, disseminate, and exploit the preliminary and final project results.

The interaction between the project's general objective, outcomes, outputs and activities is illustrated in the Theory of Change map under 5.2. below.

Scope

The primary focus of the deployEMDS project is to pave the way toward the realisation of a common European Mobility Data Space as one of the sectoral data spaces to be developed as part of the broader European ambition.

deployEMDS builds on 16 use cases from nine cities and regions across Europe, aiming to lay the groundwork for an interoperable, secure and trusted EMDS. The project covers diverse urban mobility environments and a geographic scope ranging from metropolitan to suburban areas. The involved cities and regions represent a cross-section of European mobility challenges and opportunities. The collaboration among these cities and regions fosters a holistic approach to mobility in Europe by acknowledging and addressing the diverse needs and requirements of the participating cities and regions.

deployEMDS addresses various aspects of mobility through its use cases, notably:

- Data for mobility planning: Leveraging data to support the effective planning and management of transportation and mobility system as well as to optimise traffic flow.
- Multimodality: Using data to enhance multimodal route planning and optimise the utilisation of multiple modes or forms of transportation.
- Public transport operation: Leveraging data for the optimisation of fleet management and operational excellence of public transportation.
- Speciality travel information: Utilising data to improve services for vulnerable travellers, creating a more inclusive and accessible transportation experience.

In addition, given the cross-border nature of mobility, deployEMDS considers the need of mobility data spaces to be interoperable with other sectoral data space initiatives. This ensures that data can be easily shared and understood across various sectors.

2.2 Rationale and value proposition

Mobility data hold great potential for urban mobility. Mobility services, for example, rely extensively on diverse data sets, encompassing both persistent and streaming data, fundamental for the operational effectiveness of Mobility-as-a-Service concepts. Within this domain, stakeholders — service providers and regulatory bodies alike — require access to shared data encompassing vehicle availability, booking processes, and customer requirements. Yet, these critical data pools remain fragmented within isolated silos. The fragmentation arises from multifaceted reasons: data owners seek to safeguard competitive advantages, uphold data privacy, and manage the intricacies and costs associated with data sharing. On the other hand, potential data recipients voice concerns about data quality and the overall trustworthiness of these exchanges, among other considerations. In summary, lacking data sovereignty, trust, and interoperability hinder the utilisation of this most valuable resource.[10] Unlike a centralised database, the vision of a common EMDS is to offer a decentralised framework to interlink and federate diverse transport-data ecosystems at EU, national, regional, and local levels. By addressing the technical and legal barriers, the EMDS strives to facilitate trusted and secure data-sharing across Europe.

deployEMDS aims to make extensive mobility data discoverable, usable, and applicable at the city level while demonstrating cross-border data sharing. By leveraging business, legal, and technical expertise and perspectives from across Europe, the project evaluates various frameworks and best practices to establish a technical infrastructure and governance mechanisms catering to the specific needs of the multiple stakeholders involved. In contrast to National Access Points, which focus on ensuring accessibility to transport-related data within each Member State, deployEMDS goes beyond national boundaries. deployEMDS aims to demonstrate value creation across nine European cities and regions, showing its transformative impact through various urban mobility use cases. These real-life examples of new or improved services and processes serve as tangible illustrations, aiding stakeholders to understand the practical benefits of the seemingly complex concept of data spaces. It should be noted that deployEMDS is not just a demonstration initiative; it actively supports the deployment of building blocks to lay the groundwork for a common European mobility data space. Lastly, through various forms of engagement with external stakeholders, spill-over effects and learnings are created beyond the project's use cases, inspiring innovative and improved applications.

2.3 Stakeholder analysis

The success of establishing a common EMDS depends on adding value for the multiple stakeholders in the mobility sector. Performing a stakeholder analysis is therefore essential to understand the relevant stakeholders, their (potential) roles within the deployEMDS project, and the benefits they may derive from it. The table below aids strategic understanding for navigating the complex stakeholder landscape of EMDS. These insights are taken into account for the communication, dissemination and stakeholder engagement activities planned within the project (see Communication, Dissemination and Exploitation plan). For practical reasons, communication, dissemination, and exploitation efforts will follow the simplified categorisation into four key target groups, as explained in Chapter 3.3 below.

[10] PrepDSpace4Mobility. (2023). Analysis Report D3.1, pp. 44-49, 55. Available at: https://mobilitydataspace-csa.eu/wp-content/uploads/2023/10/deliverable-3.1.pdf

Table 1: Stakeholder groups, (potential) roles in deployEMDS and benefits through the project

Stakeholder group	(Potential) role in deployEMDS	Benefit through project
Regulatory actors (e.g. EU decision makers, national governments, National Access Points)	Setting of framework conditions for future standardisation, interoperability, and scalability of the common data space architecture in the mobility domain	Support of strategic aims related to data economy and the shift to sustainable and smart mobility
Regional public authorities and mobility operators (city administrations, public transit authorities, urban planners)	Coordination and deployment of local implementation projects based on specific use cases (beneficiary cities in project) Development of additional potential use cases and participation in consultations on common way forward for urban mobility data practices in Europe (network of follower cities)	Easier access to relevant and combined data for better policymaking and more innovative and efficient mobility services and systems Contribute to and access new approaches for public-private sector governance models for local mobility services, compliant with new EU data regulation
Technical partners and local use case coordinators	Iterative development and deployment of common technical infrastructure based on feedback regarding specific needs and requirements for use cases	Influence on development and deployment of common data space components and infrastructure Refine deployment approaches based on intermediary results from fellow regional pilots of similar use cases
Data space standards groups, initiatives and associations (e.g. DSSC, Gaia-X, IDSA, FIWARE)	Regular exchanges to guarantee alignment on common frameworks and to identify synergies	Best practices from real-world data space implementations Feedback to further evolving common frameworks and standards, based on piloting
Expert fora, interest groups and related projects in mobility domain (e.g. Data4PT, MaaS Alliance, CCAM, C-Roads, NAPCORE, TM2.0)	Establishment of synergies to raise awareness on the benefits of the EMDS as well as engagement to amplify the outcomes and impact of the project	Lessons on challenges and success factors for data-enabled mobility innovations Understand how their area of focus (MaaS, CCAM, NAP, etc.) impacts and is impacted by data space approaches
Research institutes and academia focused on data governance	Analyse, structure and propose governance mechanisms and best practices for organisational, legal, and market structures	Improved understanding of complex interactions of transportation systems and lessons from data space implementations

Industry actors (e.g. SMEs, corporates, start-ups, and industry associations, especially from the fields of data analytics, IoT solutions, MaaS providers and related areas)	Provision of market feedback on implementation projects related to traffic and urban mobility, upscaling of project results and development of further innovative use cases	New business, innovation and collaboration opportunities and achieving more efficient and cost-effective operations Understand and trial new technical and governance approaches that give them control as data providers through their value chains and facilitate their compliance to new EU data regulations
General public and media	Consumers' travel mode preferences and data usage patterns shape the development of mobility services and innovative use cases Media coverage contributes to wider awareness of the social, innovation and quality of life implications of the mobility applications enabled by deployEMDS	Better travel experience with more efficient transportation systems and reduced travel times Understand how data space approaches can increase data protection of the traveller/consumer across mobility services

3 Work plan and timelines

This chapter provides information on planned activities to produce the agreed outputs and to achieve the defined objectives of this project. The chapter first presents a timeline with an overview of the key deliverables and milestones per work package (WP), except for WP1, which focuses on the overall coordination and project management. Subsequently, the chapter describes the main activities for each of the five work packages.

3.1 Work packages and timelines

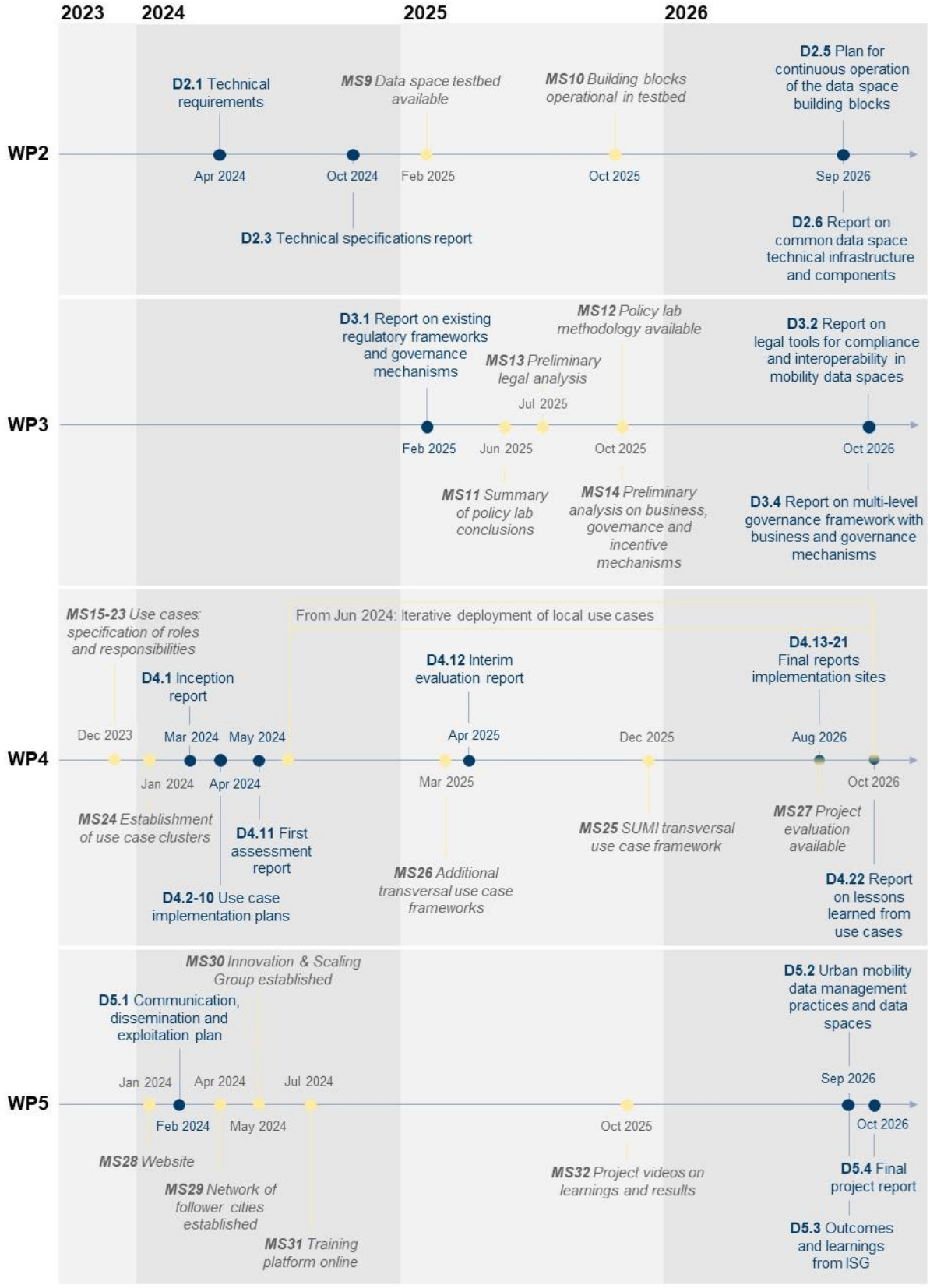


Figure 1: Project timeline with key deliverables (D) and milestones (MS) per work package

Work package 1 encompasses overall coordination and project management. The work package ensures coordination of decision-making processes and prepares, as well as organises, the Steering Committee and General Assembly meetings (see chapter 3.2 for the project governance structure). Another important aspect involves facilitating communication within the project, updating all project partners on the progress of project activities, and providing access to relevant documents. The work package lead also **ensures communication with the EC** and acts as an intermediary between the consortium and the EC. This activity involves coordinating continuous and periodic **reporting** activities and undertaking an overall assessment of the general KPIs 1-5**.** Finally, work package 1 involves setting up and coordinating an Advisory Board and Security Advisory Board.

Work package 2 comprises the deployment of an operational data space across borders **and aims at:**

- Specifying all necessary functional and non-functional requirements for the technical infrastructure.
- Facilitating alignment of technical requirements over all local implementation projects.
- Facilitating successful collaboration for the development and deployment of common building blocks.

The **initiation** of the project **includes** gathering and analysing the requirements for the technical infrastructure. The use cases (WP4) in local implementation projects form the basis for developing a technical use case specification ("use case canvas"). This process involves identifying different stakeholders and roles (e.g., data owners, providers, consumers, users) along with their respective information needs and processes. Furthermore, essential functional and non-functional requirements (scalability, availability, reliability, usability, etc.) are derived to specify the data space technical and soft infrastructure, as well as the different building blocks. The findings are summarised in the deliverable "technical requirements" (D2.1).

In addition, the work package focuses on the specification of the data space architecture and building blocks. To consider the European data spaces technical framework and the preparatory action, this task encompasses identifying and analysing existing functional data space building blocks, as well as technological solutions and software. It also involves the preparation of comprehensive technical and functional descriptions for the pertinent data space building blocks. To establish the overarching data space architecture, the relevant building blocks are specified on two levels: (a) the horizontal level ("common technical infrastructure") and (b) the local implementation project level. The "technical specifications report" (D2.3) serves as a detailed documentation of the architecture, the use case technical specification, and the testbed.

Another crucial task is to facilitate successful collaboration with local implementation projects, ensuring the development and deployment of common building blocks applicable to the operation and technical governance of all these projects.

Subsequently, the work package aims to set up, test and deploy the data space building blocks, improve, and plan for continuous operation. This includes the development and operation of data space testbeds. The "Data space testbed" (MS8) is an important guidance document with continuous updates and results from the testing. This tasks also involves deploying data space building blocks in both test and production environments, ensuring the pilot of data space building blocks will be fully in operation and available in the testbed (MS10). Additionally, the completion of a "plan for continuous operations of the data space building blocks" (D2.5) enables operations beyond project´s end. Lastly, the work package publishes the final deliverable "report on common data space technical infrastructure and components" (D2.6). This report is tailored to an informed audience and specifies and documents (a) the use case technical specification, (b) the architecture, (c) the testbed, (d) the data space building blocks, and (e) the common data space web platform.

Work package 3 focuses on the deployment of common governance mechanisms across borders, notably by:

- Identifying common regulatory challenges for mobility data sharing in relation to data spaces.
- Proposing governance mechanisms for a common European data space for mobility, drawing from the experience of local implementation projects.
- Facilitating alignment of requirements and proposed governance mechanisms.

To comprehend the current situation and provisions, the work package sets out to **map governance and regulatory structures in mobility data sharing**. Specific focus is on SUMI and traffic and travel information (RTTI, MMTIS, etc.). The work package will study relevant literature, gather inputs from experts and relevant authorities, and build on the findings in PrepDSpace4Mobility, while also taking into account the work of the study on the EMDS under CEF. It will draft D3.1 “Report on existing regulatory frameworks and governance mechanisms” with a preliminary overview of existing regulatory frameworks and governance mechanisms for mobility data sharing.

The work package involves the **organisation of policy labs** to address regulatory and governance challenges in local implementation projects. The participatory policy lab process helps to frame, discuss, and solve policy barriers in collaboration with stakeholders from the public and private sector. Further interviews with selected partners additionally contribute to identifying needs, challenges, and opportunities in local as well as cross-border mobility data sharing and to analysing roles and responsibilities under development in existing and emerging data spaces.

The **development of legal tools** aims to facilitate the deployment of urban mobility data spaces and to support the further development of the common European mobility data space. This comprises analysing legal challenges in implementing data spaces (such as accessing dynamic data, IT security, lack of trust, data protection, liability issues, intellectual property rights, the impact of competition law and product legislation) within the mobility sector. Developing legal tools is aligned with an approach featuring demand-based entry points and considering national divergence in the urban mobility sector (e.g., supporting sustainable urban mobility planning and management and making traffic and travel information at the urban level available and accessible) building on the previous analysis and the horizontal legal compass developed by the DSSC. The task also addresses the translation of trust and security mechanisms into technical features and privacy-enhancing technologies. Additionally, it requires an understanding of the sector-specific opportunities and limits of smart contract technologies for implementing agreements within mobility data spaces. A “Report on legal tools for compliance and interoperability in the mobility data spaces” (D3.2) provides) provides a toolbox to facilitate the deployment of data spaces and support the further development of the common European mobility data space.

Finally, the work package encompasses **developing business and governance mechanisms for deployment and future recommendations**. This requires defining incentives for private and public stakeholders to share data within the mobility sector, creating strategies and frameworks for cooperation, as well as recommendations for innovation and long-term financial sustainability (e.g., revenue models, data valuation, etc.) and an analysis investigating the benefits (value to citizens, business, and society) of making available/sharing mobility data. The task also involves the development of a multi-level governance framework considering the relevant governance layers for the urban mobility data space including data accessibility, the data sharing infrastructure, data governance within the data space, data security etc. The final deliverable is the “Report on multi-level governance framework with business and governance mechanisms” (D3.4).

Work package 4 comprises the deployment of the common European data space for mobility through real-life implementation projects and targets, notably:

- Facilitating technical, legal and governance alignment across all deployed European mobility data spaces.
- Facilitating successful collaboration across all local implementation projects.
- Monitoring and evaluating local implementation across all local projects.

The work package involves developing a **strategic alignment process** to ensure that developments in local implementation sites remain in scope and fit the overall project context and objectives. Additionally, it ensures that developments in horizontal work packages, in particular WP2, WP3, are in line with local priorities. A standards expert task force involving individuals from within and beyond the consortium (e.g. NAPCORE and national actors/initiatives) supports identifying standardisation gaps and developing recommendations on standardisation across local implementation projects, in particular regarding cross-border interoperability and data formats used.

An additional task aims at facilitating peer-learning and harmonisation between local implementation projects to allow for **replicability and the creation of transversal use cases**. Specifically, it comprises the development of a transversal use case with all 9 local implementation projects related to multimodality as well, as another transversal case in relation to the calculation and reporting of sustainable urban mobility indicators (SUMI). These cases could, for example, support capacity building of urban nodes to collect and report mobility data. Additionally, further use cases are to be developed, notably in collaboration with the Innovation and Scaling Group (WP 5). An “Overview report on lessons learned from use cases” (D4.22) details the development of all use cases, providing an overview of the data gaps, needs and challenges in the local sites, the transversal use case frameworks, implementation cycles and replicability.

The **establishment of a horizontal monitoring and evaluation process** enables the periodic tracking of achievements and facilitates potential re-orientation of local implementation projects. A “First assessment report” (D4.11) presents preliminary recommendations on harmonisation, potential synergies, risks and challenges that support horizontal streamlining and includes the assessment of the status quo, roles and local governance, and compares the technical baselines and future technical implementations. An “Interim report” will present the progress of activities (D4.12) in early 2025. A comprehensive project evaluation (MS27) will feed into the project’s final report at the end of the project.

Finally, this work packages encompasses the **deployment of data space building blocks and implementation of the use cases** in 9 cities and regions. All the implementation projects are elaborated in Chapter 7 of this report. Each local coordinator submits a “Use case implementation plan” (D4.2-D4.10) and a “Final report” documenting and reflecting the implementation of the use case implementation plan (D4.13-D4.21).

Work package 5 is responsible for Communication, Dissemination, Exploitation and Stakeholder Engagement and aims at:

- Gaining visibility for the project, its objectives, and its results.
- Informing interested stakeholders including the public, the European Commission, and further decision-makers.
- Building a network of interested stakeholders and participants to expand the European ecosystem of data providers and users using common building blocks.

The work package involves the development of a “**CDE plan**” (D5.1) to support the overall strategy, timetable and procedures for communication, dissemination and exploitation activities. The **communication** of

(preliminary) results **to the wider public** (target group 1) takes place through the website to raise awareness, create trust, and demonstrate the achievements of European collaboration on data spaces. The **dissemination** of (preliminary) results **to business and operational stakeholders** (target group 2) takes place through liaising with EC expert forums, such as CCAM and EGUM, as well as related projects, such as NAPCORE (via BASt) and Data4PT (e.g. via the project's Advisory Board), facilitating exchange of best practices and learnings through public meetings, webinars, conferences and promoting the work and aligning it with relevant initiatives and associations, such as the DSSC and sectoral common European data spaces, as well as other European initiatives, e.g., Gaia-X, IDSA, FIWARE. The **exploitation**, along with the information **to the European Commission and other decision makers**, occurs through regular updates and exchanges on ongoing work progress, as well as measures **to broaden the European ecosystem** of data providers and users adopting and making use of common building blocks. Specifically, through the engagement with a network of follower cities and regions, the set-up of a matchmaking platform of technology providers, industry, non-profit and public sector stakeholders, i.e., **Innovation and Scaling Group (ISG),** and the establishment a comprehensive training programme involving experts from the consortium and beyond. Finally, the work package is responsible to publish the "Project's final report" (D5.4) summarising the results and deliverables and presenting overall outcomes, lessons learned, best practices, and conclusions for local implementation of data spaces, as well as for the establishment and scaling of a common European-wide data space for mobility.

3.2 Project governance and interaction between work packages

The project consortium comprises 39 beneficiaries clustered into the following groups:

- overall project management, horizontal alignment partners and local coordinators acting as the 'glue' of the project and providing support to all implementation projects across the consortium,
- partners with strong expertise in the technical, legal and governance fields,
- partners with strong European networks, ensuring effective communication, dissemination and stakeholder engagement,
- diverse local stakeholders, including public (cities, public transport authorities, regions) and private actors (transport providers, SMEs, digital service providers), as well as research institutes, that implement and use the technical infrastructure combined with governance mechanisms for interoperable, secure, and efficient mobility data sharing for multimodal integration, traffic management, and monitoring Sustainable Urban Mobility Indicators (SUMI).

Given the high complexity and diversity of stakeholder ecosystems involved, several consortium bodies ensure successful planning, coordination, management, and communication in the project:

The **General Assembly** is the ultimate decision-making body of the consortium and is comprised of one representative of each beneficiary (one vote per beneficiary). Associated partners may attend General Assembly meetings without voting rights. The General Assembly convenes as a physical meeting once a year. In addition, the consortium meets virtually once a month.

The coordinator (WP1) regularly reviews and assesses the overall progress of the project against the task description and established milestones and deliverables, building on the KPIs defined for the project. WP1 organises monthly meetings with the project's **Steering Committee** composed of WP leads, as well as one representative of each city and region implementing use cases, to discuss any challenges or issues that may arise, and to identify potential solutions and mitigate risks. The Steering Committee uses project plans with task breakdowns and a detailed Gantt chart, to track the progress of tasks and activities and to identify any

potential bottlenecks or delays. Both bodies, the General Assembly and the Steering Committee, are managed and chaired by the coordinator.

To support the Steering Committee, WP4 maintains clear lines of communication with the nine local implementation projects and facilitates **monthly strategic alignment** workshops to provide an additional space for coordination on specific issues between the different work packages. The process also enables regular feedback loops and information flow between the central and the local project structure. Additional feedback loops and coordination meetings are held between WP2 and WP4.

The **Advisory Board** is comprised of a broad range of leading experts and supports the project. The Security Advisory Board (SAB) has been established as part of the Advisory Board. The SAB reviews critical project deliverables, assesses whether they include any security sensitive information and proposes timely measures for preventing the misuse of such information. The process is managed by the Project Security Office (PSO).

The following figure illustrates the project´s setup and the interactions between work packages (1-5) and key partners.

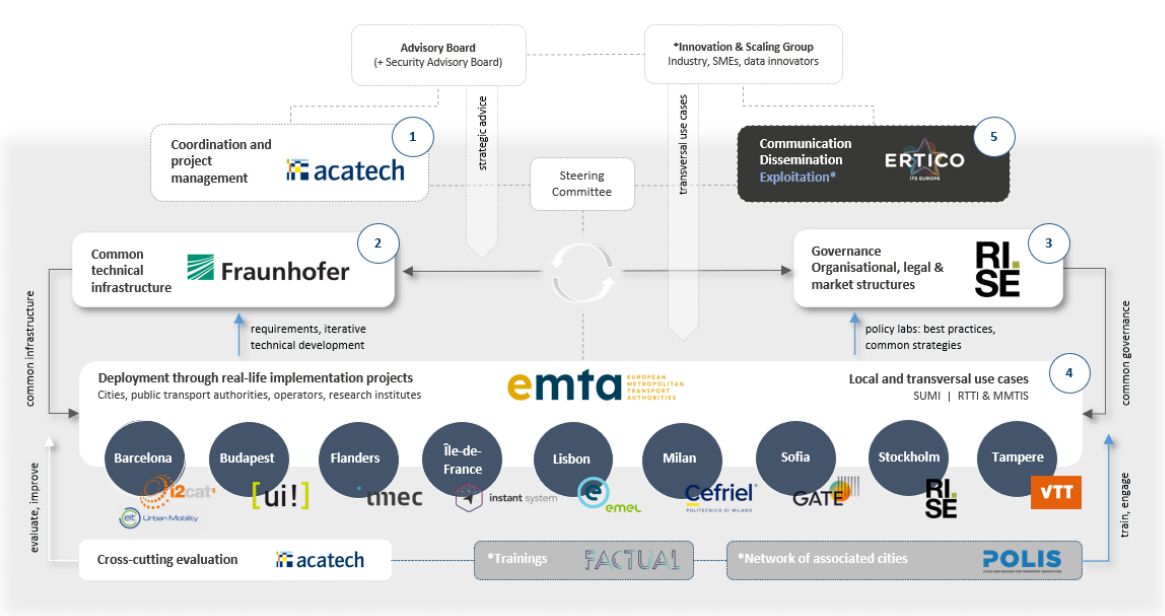


Figure 2: Project setup and interactions between work packages

3.3 Communication, dissemination and stakeholder engagement

To ensure that diverse perspectives are considered and pave the way for a sustainable utilisation of the common European mobility data space, an inclusive approach to stakeholder engagement is essential throughout the project duration. This overview provides a broad perspective on the varying interactions and communications, detailing when and how engagement activities should unfold with identified stakeholders. The engagement outline employs various strategies to tailor involvement with target groups according to their needs and impact on the project. Communication, dissemination, exploitation, and stakeholder engagement activities play a vital role in effectively sharing preliminary and final project results within relevant ecosystems and communities. The strategy involves a multi-faceted approach, including diverse channels

such as a project website, workshops, press releases, social media networks, and newsletters. While this chapter provides a brief oversight, the Communication, Dissemination, and Exploitation plan detailed in Deliverable D5.1 serves as a more comprehensive guide, offering the overall strategy and timeline for these activities. The plan, coordinated by ERTICO and incorporating input from local implementation projects, aligns with the project's objectives and ensures strategic execution.

In this report, it is important to distinguish between the terms "target groups" and "stakeholders". In this context, "target groups" refer to specific audience clusters, while "stakeholders" encompass a broader range of entities that may be impacted by or have an impact on the project, as detailed in Chapter 2.3.

The target audience will be clustered into the following groups:

- EU decision-makers, local and public authorities (regulatory) (target group 1),
- business and operational stakeholders (data users and providers/data space operators) (target group 2),
- functional and technology stakeholders (implementation enablers) (target group 3), and
- the general public and media (target group 4).

The table below provides a tentative timeline for stakeholder interaction, detailing the timing and approach for engaging various target groups.

Table 2: Overview and tentative timeline for stakeholder interaction

Engagement activity	Purpose	Target group	Timetable
Website	Promote the project and share results with the general public, disseminate results to key decision makers, stakeholders and relevant expert circles, and inform about the project's progress and outcomes.	Regulatory, business and operational stakeholders, implementation enablers, general	By 30.11.2023: LinkedIn profile launched By 31.01.2024: Website online, continuously updated
Online and physical training workshops	Host training workshops on various topics (see timetable).	Regulatory, business and operational stakeholders, implementation enablers	By 31.07.2024: Platform online, 1st training held online (Basic technical aspects of mobility data spaces) By 31.07.2025: 2nd training held online/in-person (EU and selected national regulatory initiatives shaping local and cross-border on mobility data sharing and interoperability) By 30.09.2025: 3rd training held online (Organisational, legal and community aspects related to be considered when building common data spaces)

			By 31.12.2025: 1st additional training held By 01.04.2026: 4th training held in-person (Case studies from the project highlighting technical and non-technical issues as well as coping strategies and solutions) By 31.10.2025: 2nd additional training held
Network of follower cities and regions	The network will remain open during the project's lifetime and will seek to engage local and regional authorities interested in working with the project, aiming to involve authorities with different levels of experience/maturity.	Regulatory	By 30.04.2024: Network established By 30.09.2026: Urban mobility data management practices and data spaces
Innovation and Scaling Group	Discuss strategic directions and act as multiplier to the entire concept, promote innovation that leverages mobility data, scale deployEMDS initiatives, and propose further use cases, including transversal ones that address data availability in strategic areas in line with deployEMDS goals.	Business and operational stakeholders, implementation enablers	By 31.05.2024: Innovation and Scaling Group established with launch meeting (1st workshop). 2nd workshop: 01.11.2024 3rd workshop: 01.05.2025 4th workshop: 01.11.2025 5th workshop: 01.05.2026 6th workshop: 31.10.2026 The bi-annual workshop dates are indicative and will be aligned with the project or major EMDS events to create synergies. By 30.09.2026: Outcomes and learnings published
Final Report	Generate a summary of the results and deliverables and present overall outcomes, lessons learned, best practices, and conclusions for local implementation of data spaces, as well as for the establishment and scaling of a common European-wide data space for mobility.	Regulatory, business and operational stakeholders, implementation enablers	By 31.10.2026: Final report published

Newsletters	Send regular updates and information on progress, events, and more.	Regulatory, general	By February 2024: First newsletter. By June 2024: Second newsletter. By October 2024: Third newsletter. And so on, with subsequent newsletters planned for February 2025, June 2025, October 2025, and beyond.
Project video	Publish videos to facilitate asynchronous learning.	Regulatory, business and operational stakeholders, implementation enablers, general	By 31.10.2025: Two project videos on learnings and results published

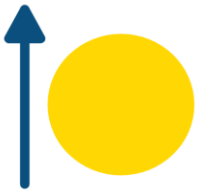
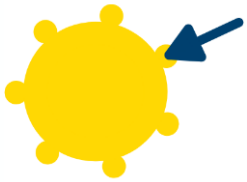
4 Risk assessment and mitigation

Risk assessment and mitigation are integral to strategic planning for the successful execution of deployEMDS. It is therefore crucial to identify and address potential risks that may impact the project's objectives, timeline, or outcomes, and to present strategies to manage and mitigate these risks.

Risk mitigation strategies are commonly divided into four types: acceptance, avoidance, transfer and reduction[11]. As described in Table 3, risks differ, firstly, in their severity and, secondly, in their controllability. Strategies, therefore, divide risks into those that require (at least partial) acceptance, those that require complete avoidance, and those that require risk transfer through the implementation of a "Plan B".

[11] Herrera, Michael. (2013). What is Risk Mitigation? The four types and how to apply them. Blog post. Retrieved on 04.03.2024 from https://www.mha-it.com/2013/05/17/four-types-of-risk-mitigation/.

Table 3: Risk mitigation types and explanations, based on Business Continuity and Disaster Recovery Theory

Accept	Avoid	Transfer	Reduce
			
= Risks that are impossible or very difficult to mitigate. These risks should be tolerated and dealt with by being monitored closely.	= Risks that should be strictly avoided due to severe consequences.	= Risks that would be a heavy burden regarding resources and should therefore be mitigated by involving a third party or similar measures.	= Risks that require both acceptance and avoidance simultaneously. These should be addressed with early action.

As part of the project preparation phase, several risks have already been assessed, ranked, and mitigation strategies have been established. However, to enhance the understanding and management of these risks, a hierarchical structure of possible risk sources, known as the Risk Breakdown Structure, is employed. The structure organises and describes a project's overall risk exposure, with each declining level denoting a more thorough explanation of the risk sources. It helps to identify dependencies or correlations between risks and concentrates the development of mitigation strategies on tangible risk categories. The outlined matrix in Table 4 presents an adjusted form of the risk breakdown structure for generic projects. The accompanying matrix in refines the generic risk breakdown structure to align with deployEMDS.

Moreover, it is essential to note that the risk assessment process was dynamic, involving input from breakout sessions during the workshop at the First General Assembly meeting of deployEMDS in Barcelona on November 7, 2023. The workshop served as a collaborative platform where breakout groups assessed and ranked the risks previously identified in during the project preparation phase. Participants were also encouraged to add any additional risks they deemed significant. The insights from this workshop contribute to a holistic understanding of the project's risk landscape, guaranteeing that all relevant concerns are considered in the risk management strategy. Risks that were additionally identified next were added as well as a notion of priority for those risks that were mentioned as most pressing.

Table 4: Grouping of risks and mitigation strategies

Category	Sub-category	Risk	Likelihood	Impact	Prioritised by consortium	Mitigation type
Internal	Coordi-nation and project manage-ment	Risk of budgetary issues, e.g., using more or less budget than planned	Medium	Medium		
		Unclear prioritisation of objectives	Low	High		
		Delay in deliverables and milestones	Low	Medium		
		Security sensitive information	Medium	High		
		Unclear responsibilities within and across stakeholder organisations	Medium	High	2nd most mentioned by consortium members	
		Lacking involvement of private parties	Low	Medium		
	Partner organi-sations	Drafted deliverables do not meet quality expectations	Low	High		
		Lack of consensus on critical decisions	Low	Medium	2nd most mentioned by consortium members	
		Ethical or scientific misconduct; conflicts of interest	Low	High		

		Low engagement of service and technical partners	Low	High		
		Low engagement of local use case partners	Low	High	2nd most mentioned by consortium members	
		Under-performance or withdrawal of consortium partner	Low	Medium		
		Lacking capacity of consortium members to contribute	Medium	Medium		
		Partners may face challenges in understanding the technical requirements of their roles, increasing the likelihood of misalignment	Low	High		
		Intellectual Property Rights (IPR) concerns may arise during joint work, posing a potential threat to collaboration	Low	Medium		
		Legal issues may emerge, introducing uncertainties and affecting the smooth operation of the project	Low	Medium		
External	Stake-holder engage-ment	Low participation at the trainings offered as part of the dissemination	Medium	Low		

		Differences in local needs and requirements for technical infrastructure	Medium	High	Most mentioned by consortium members	
Techno-logy	Require-ments	Incompatibility between data formats	High	Medium	Most mentioned by consortium members	
		Differing views on the development of technical infrastructure by several technical partners involved	Low	Medium		
		Use cases cannot be fit into the general architecture	Low	High		
	Perfor-mance	Change and increase in project timeline due to internal factors, i.e., readiness of implementation projects, or external factors, i.e., availability or adaptability of SIMPL to project requirements	Medium	Medium	2nd most mentioned by consortium members	

The project's mitigation strategy divides risks into those that require (at least partial) acceptance, those that require complete avoidance, and those that require risk transfer through the implementation of a "Plan B". The following paragraphs summarise mitigation strategies according to these three types.

Risks that must be **accepted** are difficult or impossible to influence from the consortium's point of view. For such risks, only close monitoring can help to anticipate and ultimately mitigate the potential impact. Acceptance is required for possible changes and extensions to the project timetable due to internal or external factors, e.g. the timetable of the SIMPL project, the influence of the EMDS technical study or the development of the EDIC on Mobility and Logistics Data. This uncertainty needs to be managed by monitoring developments and introducing placeholders if and for as long as necessary. As the consortium partners are involved in a wide range of these projects, the Steering Committee, meetings with the respective project officers of the EC, and work package meetings provide an opportunity to touch base and strategise based on the results on the horizon. Another example is (possible) low participation in the trainings offered, which the consortium can prevent but ultimately cannot mitigate. The task requires broad involvement of the networks of the consortium members.

Complete **avoidance** is reserved for risks with the potential to severely jeopardise the project's success. This is particularly relevant for security and ethics-related risks, such as the accidental publication of sensitive information or breaches of ethical and scientific conduct. To mitigate these risks, a Security Advisory Board, comprised of experts in data, legal, and cyber security, diligently reviews deliverables before publication. Another area requiring avoidance strategies is the potential occurrence of Intellectual Property Rights (IPR) issues. The consortium leverages legal advice to ensure compliance with IPR regulations so that collaboration is not hindered. IPR issues are also dealt with in a targeted and dedicated manner in the Consortium Agreement. Additionally, addressing possible mismatches between use cases and the overall architecture is critical. Discrepancies or difficulties in making the proposed use cases seamlessly work within the broader technical infrastructure could hinder the effective implementation of those use cases, and a central outcome of the project may be lost. Governmental and technical expertise within the consortium guide the process, ensuring alignment with best practices and preventing potential issues.

Risks to be **transferred** require security through some form of outsourcing because the problem cannot be solved by project management or those performing the task themselves. Some of the issues identified for the use of deployEMDS require the involvement of members within and outside the consortium. An iterative process that foresees a timely quality assurance review by consortium members from other tasks or work packages helps to ensure high quality of deliverables and other outputs. External reviews help to challenge or validate results for further refinement. In addition, the coordinator, together with the WP leaders and local use case coordinators, monitor progress and maintain ongoing continuous communication to identify and mitigate underperformance in the consortium. As a last resort, the Steering Committee may decide by majority vote to reallocate resources to ensure the desired progress. The same applies if consortium partners lack the capacity to contribute to the project. Lastly, the risk of a lack of consensus on critical decisions might also need a transfer into the Steering Committee: Generally, conflicts as such should be flagged to the WP lead and the coordinator. If major decisions need to be taken, these should be brought to the attention of the Steering Committee and the General Assembly whose priority is to mediate and achieve consensus. The last resort includes a majority vote of the Steering Committee.

Reduction of risks, a mixture of acceptance and avoidance, is the appropriate mitigation strategy for a broad range of issues. In the following, they are addressed with respect to their category, and respective subcategory:

Most coordination and project management issues are appropriately addressed through the approach of risk reduction. This includes installing measures to avoid risk occurrences, planning for eventual events, and allowing the Steering Committee to decide on a way forward. Management-specific tasks, such as monitoring the budget, time plan, and ensuring clear prioritisation and responsibilities, demand a combination of monitoring, early detection, and appropriate tools. In case of a lack of consensus on critical decisions, one-to-one conversations can prevent conflicts from escalating, and the General Assembly or Steering Committee can take decisive action. The installation of a trust person selected by the General Assembly serves as a neutral contact point for addressing any arising issues. Low engagement of partners is mitigated through engaging exchanges, early detection through ongoing conversations, and the use of comprehensive project handbooks and welcome emails for smooth onboarding.

Issues related to low engagement of service and technical partners, low engagement of local use case partners, partners not understanding technical requirements, and potential legal issues are categorised as partner organisation challenges. Low engagement of partners of any background is prevented by onboarding team members through an onboarding process, communicating all relevant contact points and processes. Should partners still display low participation rate in meetings, they will further be approached by WP leaders or coordination in a trustful manner to identify underlying issues. Local use case partners have been identified as particularly watch-out-worthy and are partnered with a technical "buddy" from WP2, ensuring mentorship and early flagging of deeper issues. The same holds true for the mitigation of misunderstanding and low

understanding of technical requirements: mitigation involves ensuring engaging exchanges, early detection through ongoing conversations, and regular check-ins in bigger formats.

Differences in local needs and requirements for technical infrastructure are identified as external issues. WP4 leaders play a proactive role in addressing these challenges through early detection and harmonisation efforts integrated into the iterative strategic alignment process across all implementation sites. Specific requirements are systematically gathered in WP2 to facilitate the development of a minimum common infrastructure.

Incompatibility between data formats and differing views on the development of technical infrastructure are classified as technology requirement problems. Mitigation strategies involve early detection, harmonisation efforts, and ongoing technical support led by WP4 leaders. The iterative strategic alignment process across implementation sites, along with the gathering of specific requirements in WP2, ensures the development of a minimum viable common infrastructure. Conflict management procedures are applied to address differing views, emphasising continuous communication and one-to-one dialogues focusing on common ground and balancing interests.

In conclusion, the combination of these mitigation strategies forms a robust framework to address various risks. This multifaceted approach not only minimises the impact of potential risks but also fosters a resilient and adaptive project environment.

It should be noted that due to the dynamic nature of the project, not every possible issue can be foreseen. Therefore, the identification of potential risks prepares the project consortium for anticipation and minimises the likelihood and impact of issues that could endanger the process and success of the project. Additionally, continuous monitoring by the project coordinator and overall adaptability ensures a robust project setup.

5 Monitoring and evaluation

5.1 Monitoring and evaluation method

The monitoring and evaluation (M&E) framework for deployEMDS is developed under work package 4, task 4.3, and managed by the coordinator.

The M&E methodology used is the **"Theory of Change" (ToC)** approach[12]. ToC is a comprehensive framework that helps projects articulate and map out the causal pathways underlying how interventions should lead to desired outcomes. It provides a systematic way to plan, monitor, and evaluate the impact of projects. The ToC approach is dynamic and encourages continuous learning and adaptation throughout the life of a program. It emphasises the importance of understanding the context and engaging stakeholders in the M&E process. The combination of quantitative and qualitative approaches ensures a more holistic assessment. The following aspects form the basis for the deployEMDS M&E work:

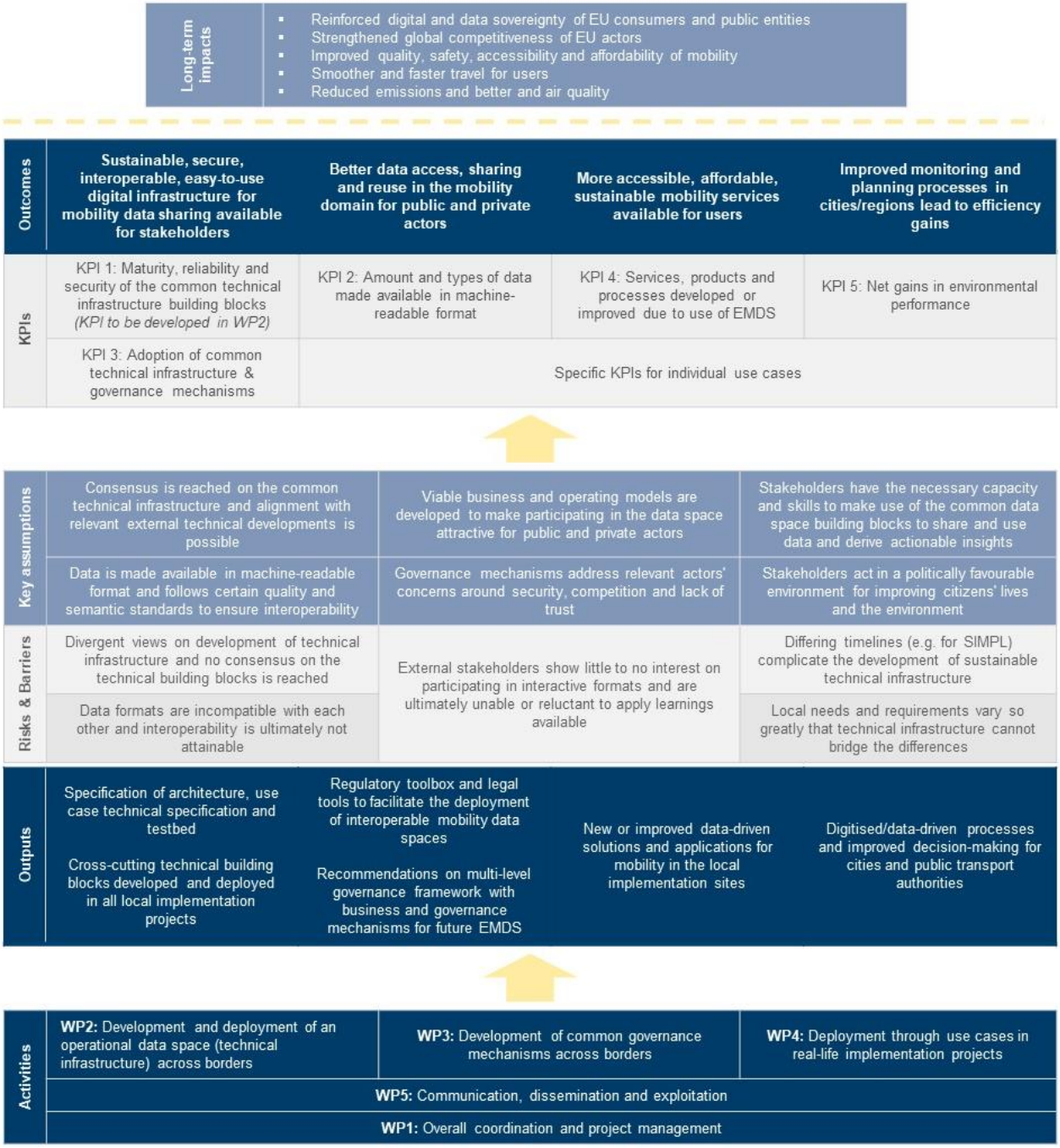
[12] UN Development Assistance Framework Guidance. (2017). Theory of Change. United Nations Development Group. Retrieved from https://unsdg.un.org/sites/default/files/UNDG-UNDAF-Companion-Pieces-7-Theory-of-Change.pdf

- **Outcomes and impacts.** During the kick-off meeting in November 2023, the consortium members identified desired outcomes and long-term impacts the project aims to contribute to. These are based on the broader policy objectives of the European Commission, notably related to the strategic goals of strengthening the digital economy and achieving sustainable and green mobility.
- **Theory of Change map.** The Theory of Change map below in 5.2. outlines the logical relationship between activities, outputs, outcomes, long-term impacts and associated key assumptions and risks. It was created based on the results of a Steering Committee workshop and incorporates inputs and shared visions discussed at the first deployEMDS General Assembly meeting and project kick-off in November 2023. The map may be further refined together with the work packages to include additional context and qualitative success criteria to complement the KPIs.
- **Key performance indicators (KPIs).** Several KPIs have been set by the project to track impacts and progress (see 5.3). Further KPIs are to be defined in the course of the project. KPIs must be specific, measurable, achievable, relevant, and time-bound (SMART).
- **Data collection and monitoring.** A monitoring plan has been established in the project, outlined under 5.4 and 5.5 below. Data will be collected regularly according to the methods outlined under 5.3 to assess whether activities are being implemented as planned and whether progress is being made. Stakeholder consultations complement the inputs.
- **Stakeholder engagement.** The coordinator will identify and engage relevant stakeholders, including beneficiaries and external experts to understand their perspectives, expectations and insights. Relevant stakeholders are selected and consulted based on their participation in project activities, such as use cases, workshops, trainings, etc. (see also Chapter 2.3 and 3.3 above).
- **Context analysis.** The coordinators will consider the social, economic, political and cultural context in which the interventions are taking place and identify possible external and internal factors that influence the success of the project. The context analysis may use inputs from the risk assessment presented in Chapter 4.
- **Learning and adaptation.** Findings from the M&E process will be presented in Steering Committee meetings and communicated in deliverables for transparency (see Chapter 5.5 below), including recommendations for improvement across all WPs. The project will establish best practices to inform replicability and the scaling of successful approaches.

5.2 Theory of Change

The Theory of Change map below summarises the logical sequence from the project's main activities to the desired outcomes and broader long-term impacts.

Table 5: Theory of Change map of the deployEMDS project



5.3 Success criteria and key performance indicators (KPIs)

KPIs are the metrics set to quantify the achievement of the success criteria. The deployEMDS project KPIs and measurement approaches are clustered under broad success criteria (KPI 1-5). KPIs that are specific to use cases are detailed further in Chapter 7. These KPIs provide a current snapshot and are subject to further harmonisation.

KPI 1 "Maturity, reliability and security of the common technical infrastructure building blocks deployed"

- The definition of KPIs specific for WP2 will take place by month 6, along with a definition of feedback loops with the project's use cases (see Chapter 7). This will include the assessment of availability, maturity, scalability, latency, reliability, usability, etc. of existing technological solutions and their applicability to the project's use cases.
- In addition, a testbed environment for interoperability tests and measuring maturity, scalability, latency, reliability, usability, etc. of the common technical infrastructure building blocks developed for the project will inform the continuous improvement and adaptation of the common technical infrastructure ("feedback loops").

KPI 2 "Amount and types of data made available in machine-readable format"

- Number of datasets made available through the EMDS by the end of the project (machine-readable and ITS Directive Delegated Acts compliant where relevant)
- % change in the volume of data made available over the course of the project (comparison of different stages of the project, according to framework and timeline for monitoring and evaluation prepared by M4)

KPI 3 "Adoption of the common technical infrastructure and governance mechanisms by different types of participants (e.g., cities, public transport authorities, mobility service providers, SMEs) across the European Union"

- Number of entities registered in the local data spaces. A breakdown by type of entity is included for each of the local implementation sites.
- % change in data requests over the course of the project

KPI 4 "Services, products and processes developed or improved due to the use of the common European mobility data space"

- Number of new services, products and processes
- Number of improved services, products and processes (e.g., new features)
- % change in the number of users of the new or improved service over the course of the project

KPI 5 "Net gains in environmental performance enabled by the common European mobility data space deployment project(s)"

- Where possible and relevant, the following KPIs will be measured despite limited informative value on causality links between the indicators and the project:
    - % change in annual CO2 emissions (tons) in geographic areas where the new or improved services have been implemented
    - % change in mode share in areas where the new or improved services have been implemented
- Development of two common prediction models on mode share and emissions to estimate long-term behavioural and environmental effects of the innovations and services developed and piloted during the project, based on initial pilot results and scalability of use cases, i.e., % change in mode shares and predicted % change in 5-year emissions forecast. This approach will help cities and regions develop capabilities for estimating impact of larger digitisation projects and will be available for use and further improvement by stakeholders outside the project.

- In addition, where relevant, local implementation projects will explore the potential of surveys to MaaS platform users, incl. the impact in their travel plans as reflected in a) general transport data and b) deployEMDS specific use cases and related change in their travel behaviour.

5.4 Conditions and barriers for success

Beyond the key assumptions and risks and barriers identified in the Theory of Change map and Chapter 4, several conditions affect the achievement of broader desired outcomes and impacts. These are particularly relevant for the implementation of use cases as well as their sustainability and long-term impact in the cities and regions. These conditions and barriers for success will be crucial for the qualitative context analysis complementing the quantitative analysis of KPIs defined under Chapter 5.3.

The project has made the following assumptions on required conditions for success:

- Awareness, willingness and motivation to drive digitisation for societal good
- Favourable political environment
- Availability of financial resources and stable funding models
- Availability of expertise and skilled labour
- Connectivity and functioning infrastructure

Key barriers that can interact with each other (one may lead to another). Some are more fundamental and can affect the whole workflow and may have important knock-on effects:

- Skill shortage
- Insufficient financial resources
- Unclear, hindering or lacking regulations and guidelines
- Cooperation and communication siloes
- Willingness and commitment
- Data standards and data quality fragmentation
- Machine-readability of information or data
- System obstacles to seamless integration and interoperability
- High-speed connectivity and transmission infrastructure
- Business model, distribution of revenues/losses in cooperative settings
- Unclear distribution of roles
- Low customer adoption or acceptance, e.g. due to a lack of trust or digital skills

5.5 Data collection and reporting methods

Data collection methods and sources

The project's data collection strategy encompasses a mix of methodologies aimed at capturing both quantitative and qualitative aspects of stakeholder perceptions and project impacts. These include reporting as well as consultative discussions and participatory methods:

- **Progress reporting templates.** Reporting templates will form the primary source for quantitative data collection and monitoring of KPIs. They may include additional questions on experience as well as advice and support needs.

- **Interviews.** Stakeholder interviews will help gather expectations, perceptions and experiences from stakeholders inside and outside the project.
- **Focus groups.** Focus group discussions will be organised to dive deeper into specific topics, encouraging stakeholders to share their insights, concerns, and suggestions in a collaborative setting. The topics for focus groups will be closely linked to the Theory of Change and assumptions and risks affecting progress towards achieving expected outcomes. Selected external stakeholders will be invited to reflect on project impacts. Qualitative context analysis resulting from this exercise will also take into account perceptions about conditions and barriers for success identified in 5.4.

Monitoring and evaluation cycles and timeline

The monitoring and evaluation framework is designed to ensure continuous learning and adaptation throughout the project lifecycle. The timeline is structured as follows:

Table 6: Monitoring and evaluation framework and timeline

Inception report	**February 2024**
Develop the methodology, design of reporting templates for progress reports	March 2024
PHASE 1 Collection of progress reports from local coordinators	April 2024
Comparison of local implementation plans	May 2024
First assessment report including suggestions	**May 2024**
Development of further use-case specific KPIs based on detailed implementation plans (first use case implementation cycle)	June-August 2024
PHASE 2 Collection of progress reports from local coordinators	September 2024
Compare and assess results and derive learnings for WP4 horizontal activities	October 2024
Specify sub-KPIs to KPI 1 “Maturity, reliability and security of the common technical infrastructure building blocks deployed” and define success criteria for consistency across implementations	October 2024
KPI 5: Development of two common prediction models on mode share and emissions to estimate long-term behavioural and environmental effects	January-March 2025
PHASE 3 Collection of progress reports from local coordinators	March 2025
Compare and assess results and derive learnings for WP4 horizontal activities	April 2025

Interim evaluation report	**April 2025**
Define KPIs for additional transversal use case framework (third use case implementation cycle)	August 2025
PHASE 4 Collection of progress reports from local coordinators	September 2025
Compare and assess results and derive learnings for WP4 horizontal activities	October 2025
Define KPIs for SUMI transversal use case framework (second use case implementation cycle)	December 2025
PHASE 5 Collection of progress reports from local coordinators	March 2026
Compare and assess results and derive learnings for WP4 horizontal activities	April 2026
PHASE 6 Collection of progress reports from local coordinators	July 2026
Compare and assess results and derive learnings for WP4 horizontal activities	August 2026
Final evaluation report and summary of learnings	**August-September 2026**

6 Status quo

6.1 Technical status quo

One of the challenges of the deployEMDS project will be to specify and deploy common technical infrastructure building blocks in accordance with the emerging European data spaces technical framework and aligned with other relevant initiatives. Several players in the data space technology domain are working towards data space-specific standards, common reference technology frameworks and technical components. The overall picture is that the maturity of data space technologies is still evolving and that there is not yet one commonly accepted or widely deployed standard. Notable functional data space architectural concepts and building blocks are currently being shaped by different initiatives, including (but not limited to) the following:

- International Data Spaces Association (IDSA)
- Gaia-X
- Eclipse Cross Federation Services Components (XFSC)
- Eclipse Data Space Components (EDC)

- iSHARE
- FIWARE
- TNO

Technical convergence efforts – i.e. the integration of previously separate technologies, functionalities, or standards, resulting in a cohesive framework – are currently underway across different data space technology initiatives. The EU-funded Data Spaces Support Centre (**DSSC**) is analysing and recommending existing concepts and technologies through a common blueprint to inform the design and interoperability of data spaces on a broader scale. In addition, the European Commission is procuring **SIMPL**, an open-source smart cloud-to-edge middleware platform that aims to support data access and interoperability among European data spaces and cloud-to-edge federations. A minimum viable platform is set to be available by the end of 2024. In addition, the Data Spaces Business Alliance (**DSBA**) is working to establish a common reference technology framework by harmonising existing architectures and technology components from **Gaia-X**, **IDSA, BDVA** and **FIWARE,** with the goal of achieving interoperability and portability across data spaces.

In the mobility domain, a big leap forward was made in 2023 by the NAPCORE project through the specification of the first release of mobilityDCAT-AP[13], a metadata specification for National Access Points and other mobility data portals, based on the already widely adopted DCAT:

> *"Metadata is a crucial building block for the accessibility and reusability of datasets, as offered on NAPs and other mobility data portals.*
>
> *So far, there has been no established common metadata approach specific to mobility data portals. mobilityDCAT-AP aims to fill this gap. It provides a structured, interoperable and harmonised approach to describing and exchanging metadata about datasets and about access for such datasets related to mobility, and in particular related to Intelligent Transport Systems (ITS).*
>
> *Its primary goal is to enhance the cross-border and cross-sectorial discoverability of ITS- and mobility-related datasets published on relevant data portals.*
>
> *mobilityDCAT-AP provides precise and unambiguous metadata designations for any data offering with mobility relevance, e.g., for representing the data topic, the data provider or the data format.*
>
> *It is highly recommended that the metadata management of National Access Points (NAPs) in Europe, or any other mobility data portals, is based on mobilityDCAT-AP in order to harmonise their data descriptions and ease the exchange of metadata in the mobility data ecosystem.*
>
> *Furthermore, this will ensure the basis for extended interoperability, among others, between individual NAPs and other data portals."*

[13] NAPCORE. (2023, October 17). Release of the mobilitydcat-ap Announcement by NAPCORE SWG4.4. Cologne. Retrieved from https://napcore.eu/release-of-the-mobilitydcat-ap

Starting from month 6 of the project, deployEMDS will identify and analyse existing functional data space building blocks, specific technical components (including connectors, identification and authentication mechanisms and technologies, catalogue services, etc.) and domain-specific interoperability building blocks based on the technical requirements of the local implementation projects. The focus will be on evaluating their maturity and relevance for the local implementation of use cases and suitability for further iterative evaluations towards the EMDS.

6.2 Legal status quo

Legal considerations will be central to the organisation and governance of the EMDS. Two dimensions are relevant for deployEMDS, as well as future EMDS activities:

- horizontal EU legislation, encompassing legislative instruments applicable across different sectors and sectoral data spaces and
- mobility-specific legislation, specifically on the provision of open data for different purposes.

Horizontal EU data legislation

The most prominent legislation in the data domain is the General Data Protection Regulation (GDPR). However, the EU is gradually moving from a data protection paradigm to facilitating data sharing and reuse under fair conditions to harness the potential of data for socio-economic purposes. New horizontal legal instruments in the data domain aim to address some of the barriers identified in the European Data Strategy[14], such as the lack of trust and fairness in the data economy, and provide minimum governance rules to facilitate data space interoperability across sectors. Several key legal instruments relevant for the Data Strategy are summarised in the table below.[15] Several other legal regimes exist, which serve broader objectives, such as competition, contracts, IP rights, electronic identification and trust, or cyber security. These legal fields must also be considered when sharing data. PrepDSpace4Mobility provided an overview of the diverse legal landscape with implications for the operation of data spaces.[16] The landscape will evolve as some proposals are still proceeding through the legislative process, while others are already in the process of implementation.

Table 7: Legislative landscape

Data Governance Act	Increase trust in data and data sharing Provide an enabling framework for data intermediation European Data Innovation Board (EDIB)	Entry into force: 23 June 2022 Applicable from: 24 Sept. 2023
Digital Markets Act	Regulate market power in the data economy	Entry into force: 1 Nov. 2022

[14] European Commission. (February 2020). Communication From the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a European strategy for data. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0066

[15] PrepDSpace4Mobility. (2023). Analysis Report D3.1, p. 93. Available at: https://mobilitydataspace-csa.eu/wp-content/uploads/2023/10/deliverable-3.1.pdf

[16] *Ibid.*

	Create a level playing field	Applicable from: 2 May 2023
Data Act	Foster access to and use of data Ensure fairness in the digital environment	Entry into force: 11 Jan. 2024 Applicable from: 12 Sept. 2025
Implementing Act High-Value Datasets (under the Open Data Directive)	Make important public-sector datasets freely available in machine-readable format Unleash the socio-economic value of data Data as a public good	Published: Jan. 2023 Deadline for making datasets available: June 2024
Artificial Intelligence Act	Balance safety and fundamental rights while strengthening AI uptake	Political agreement reached: Dec. 2023 Entry into force expected in 2024
Digital Services Act	Increase transparency and accountability for a safer digital environment	Entry into force: 16 Nov. 2022 Applicable from: 17 Feb. 2024

deployEMDS will conduct a detailed analysis of the impact and interaction of these legal regimes, particularly concerning their applicability to the project's use cases. For example, the Data Act (DA) will have an important impact on the mobility sector. Sharing data with public authorities in cases of public interest, for example, can have implications for mobility-related issues like traffic management, urban planning, and environmental regulations. Several use cases will make available data from IoT and other digital devices used in traffic and public transport, where the DA may have implications for the rights on these data. Therefore, an assessment of how the DA should apply to the use cases and their digital devices and services will need in this context.

Mobility-specific EU data legislation

Several European legislative actions (recently completed or ongoing) aim to support digitisation and data sharing in the mobility sector. The following have been identified as particularly relevant for deployEMDS.

- Revision of Directive 2010/40/EU on the deployment of intelligent transport systems ("ITS Directive"), incorporating technological advancements such as connected and automated mobility, on-demand mobility apps and multimodal mobility.
    - Revised Delegated Regulation (EU) No 2022/670 with regard to the provision of EU-wide Real-Time Traffic Information services (RTTI)
    - Revised Delegated Regulation (EU) 2024/490 with regard to the provision of EU-wide Multimodal Travel Information Services (MMTIS)
- Regulation 1315/2013 on the development of the trans-European transport network (TEN-T), currently under revision
- The ongoing Multimodal Digital Mobility Services (MDMS) initiative
- A possible further regulation on access to in-vehicle data to complement the Data Act
- A possible reiteration of a proposal on common EU specifications for Cooperative Intelligent Transport Systems (C-ITS)

Taking a closer look at the initiatives most relevant for the EMDS, Directive 2023/2661/EU, known as the amended ITS Directive, was established to facilitate the coordinated and coherent deployment and use of Intelligent Transport Systems (ITS) in road transport and its connections to other modes of transportation. The ITS Directive's Delegated Regulations provide detailed requirements for the availability and accessibility of data for specific purposes. Use cases implemented under deployEMDS focus particularly on the availability of data for real-time traffic information and multimodal travel information services, hence highlighting the relevance of the two delegated regulations mentioned above. Despite the efforts by National Access Points (NAPs) created under the ITS Directive and the coordination mechanisms under the CEF project NAPCORE, open data provision remains heterogeneous in terms of general availability and formats used, depending on the data type.[17] Anecdotal evidence suggests that public and private actors still perceive data reporting as a resource-intensive burden lacking clarity on the ultimate use or demand for the data. deployEMDS therefore adopts a more practical approach to assigning purpose and realising concrete benefits with this data at the local level, empowering cities and regions in their attempt to improve mobility for citizens based on data and digital tools.

Since there are several legal frameworks and instruments that have an impact on whether and how mobility data can be shared (e.g. legal rights to data access, legal restrictions on sharing certain categories of data), the legal aspects in data spaces will require special attention in deployEMDS. For example, some use cases may involve mobility data which is categorised as personal data, necessitating the application of the rules and principles established by the GDPR.

Initially, the project will map and investigate opportunities and limitations with current and upcoming legislation regarding data access and sharing in the mobility sector, including exploring the intersection of current and upcoming regulations on data and its usage in general, and their impact in relation to sector-specific regulations on mobility. It lays the foundation for understanding the current situation and provisions for mobility data sharing from a legal perspective and possible regulatory gaps and overlaps. Furthermore, policy labs will be organised to address specific legal challenges identified in the gap analysis and in the use cases. Legal challenges will be further analysed and, in addition, legal tools will be developed for compliance and interoperability in mobility data spaces. Partners with technical and legal expertise will collaborate on "techno-legal implementations" (trust and security mechanisms translated into technical functions; privacy-enhancing technologies to overcome legal challenges, etc.).

6.3 Governance and operational status quo

Data space governance serves as the cornerstone for overseeing data spaces comprehensively while also ensuring compliance with legislation, ethical standards, and interoperability between (local) data spaces. This encompasses data services, models, IT resources, data sovereignty, trust, and discoverability. This project is embedded within a complex stakeholder and technical environment that requires careful balance and consideration of interests. For example, balancing public and private interests, addressing power asymmetries and data monopolies, incentivising cooperation in mobility and logistics, reconciling societal values and financial viability, and managing an ecosystem of sovereign data spaces will become core tasks of a future EMDS.

[17] NAPCORE. (2024). Third report on NAP data availability. Retrieved from https://napcore.eu/wp-content/uploads/2024/01/M3.4-Third-report-on-NAP-data-availability.pdf.

Several decentralised and multi-level governance approaches have already been adopted for federated data sharing ecosystems. Their suitability for deployEMDS (and the EMDS in the long-term), as well as their coherence with legislation, will need to be assessed. Prominent examples are:

- IDSA Rulebook[18]
- Gaia-X Framework and Gaia-X Trust Framework[19]
- iSHARE framework[20]
- SITRA Fair Data Economy Rulebook[21]
- MyData[22]
- ANewGovernance[23] (under development)

With respect to governance models and mechanisms, evolving recommendations by the DSSC will become a fundamental source for the project.

With respect to the long-term operationalisation of the EMDS and its governance, several possible scenarios were anticipated by PrepDSpace4Mobility, ranging from a strong role of the EMDS in operating a data space to a more limited role in providing guidelines for interoperability. These scenarios need to be further explored and include possibilities for the creation of:

1 A European Commission (EC)-driven initiative or organisation with an operational data space authority.
2 A Member State-driven European Digital Infrastructure Consortium (EDIC)[24] serving as the foundational backbone of the EMDS.
3 A European association dedicated to data spaces in mobility, possibly steered by technical architects of Europe's major mobility and logistics data spaces.
4 A governance, regulatory or certification framework at European level.
5 An expert working group, responsible for defining and disseminating guidelines for interoperability between different mobility and logistics data ecosystems.

All scenarios imply strong involvement of existing data initiatives, as presented in the Communication on the EMDS, published by the European Commission in November 2023.[25] Governance and involvement of the

[18] International Data Spaces Association. (2023). IDSA Rulebook. White Paper. Retrieved from https://docs.internationaldataspaces.org/ids-knowledgebase/v/idsa-rulebook/front-matter/readme.

[19] Gaia-X. (n.d.). Gaia-X Framework. Retrieved from https://docs.gaia-x.eu/framework. Gaia-X. (n.d.). 2. Gaia-X Trust Framework. Retrieved from https://gaia-x.gitlab.io/policy-rules-committee/trust-framework/gaia-x_trust_framework.

[20] iShare (2024). Overview. Retrieved from https://ishareworks.atlassian.net/wiki/spaces/IS/overview.

[21] Sitra (2022), "Rulebook for a Fair Data Economy", Version 2.0, "Rulebook for a fair data economy", https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy.

[22] MyData. (n.d.). Retrieved from https://www.mydata.org.

[23] aNewGovernance. (n.d.). Retrieved from https://www.anewgovernance.org.

[24] European Commission. (2023). Policy Programme: Path to the Digital Decade – Questions and Answers. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/QANDA_21_4631.

[25] European Commission. (2023). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, Creation of a common European mobility data space. Retrieved from https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13566-Transport-data-creating-a-common-European-mobility-data-space-communication-_en.

identified stakeholders will be the task of the technical assistance study launched in January 2024 under the CEF programme. However, deployEMDS will require strong coordination with the initiatives identified in the ITS and public transport domain, including the NAPCORE project and ITxPT, as well as National Access Points (NAPs) and existing data spaces to develop meaningful governance mechanisms. Any domain-specific mechanisms developed in deployEMDS will additionally require cross-domain coordination with smart cities and communities, logistics, energy, tourism, etc., especially regarding technical and interoperability governance (e.g. minimum interoperability mechanisms, development of interoperability protocols, etc.). The ongoing preparation of a possible EDIC on Mobility and Logistics Data will be taken into account by the project.

The project's initial focus, in terms of governance aspects, is to map existing market structures and governance arrangements related to data access and sharing within the mobility sector. This will be achieved through literature studies, workshops, and interviews with stakeholders, experts, and authorities. The mapping exercise will encompass governance challenges and opportunities in mobility data sharing, international standards for data governance and relevant standards in relation to putting data into service, as data governance will have an impact on the quality of services. The deliverable will thus provide an overview of standardisation initiatives for data governance and point to similar initiatives regarding the impact of data in digital services. It will also map actors relevant to the governance of the mobility data area at EU level (including activity, responsibility, mandate, and resources) with cross-reference to the corresponding relevant actors for the project's use cases. The task will also address issues related to responsibility and liability, where national, regional, and international perspectives meet in relation to data spaces. This initial work lays the foundation for understanding the current situation and provisions in terms of governance. Specific governance challenges and legal aspects on governance will be addressed during the policy labs. The initial findings from the mapping exercise and the policy labs will inform continued work on developing business and governance mechanisms to facilitate access to and sharing of mobility data within and across borders. A multi-level governance framework that takes into account the relevant governance layers of the mobility data space will be developed. Operational recommendations, ready for deployment, as well as future-oriented recommendations toward a common European mobility data space, will be provided. Additionally, incentives for private and public stakeholders to voluntarily share data will be defined. An analysis of the benefits (such as value to citizens, businesses, and society) of making mobility data available and sharing it will further drive and encourage data sharing, even when not mandatory.

7 Local implementation projects

The following section provides a comprehensive overview of the nine implementation projects of deployEMDS. These projects encompass 16 heterogenous use cases, serving as an illustrative cross-section that represents various challenges and opportunities in European mobility. Further use cases will be defined in subsequent implementation cycles: (a) with a focus on Sustainable Urban Mobility Indicators (SUMI) and (b) transversal use cases with actors outside the project ecosystem focused on innovation and scaling.

7.1 Barcelona

Overall objective	Barcelona will implement two sets of iterative use cases piloting deployEMDS data space infrastructure to advance the regional mobility strategy.

Use Case 1	
Description	Evolve regional multi-operator data governance platform for bus fleets to support new transport models (On-demand transport [ODT] and Demand-Responsive Transit [DRT]) and interconnect operator ecosystem with third-party services.

Roles and responsibilities			
Name	Description	Role	Responsibility
i2CAT foundation	The i2CAT Foundation is a public research and innovation centre that promotes mission-driven knowledge to solve business and societal challenges, co-create solutions with a transformative impact and empower citizens.	Local coordinator, use case 1 leader, implementation partner	Local coordination of Barcelona pilots and partners, from definition to implementation. Use case co-design support and technical implementation partner of data space infrastructure for use case 1.
Metropolitan Transport Authority (ATM)	The Metropolitan Transport Authority (ATM) is a public consortium intended to articulate cooperation between the administrations responsible for public transport services and infrastructures. It also maintains relations with the different public transport operators, working to coordinate and improve the financing of the public transport system, ordering fares, planning the future regulatory framework, as well as other functions related to mobility within these areas.	PTA, public stakeholder, data provider (directly and through operator network)	Operator of regional platform at PTA. Identify use case requirements and define pilot. Data provider, from platform and fleet operators. Bridge contact with bus fleet operators for requirements gathering and user trials for pilots.
Nommon Solutions & Technologies	Nommon Solutions & Technologies is a for-profit organisation which provides information and decision-support tools to study and manage mobility and transport.	Data analytics solution provider and Decision-Support Tool developer.	Data consumer: developing analytics solutions from data provided by PTA and fleet operators. Data provider: new data to fulfil use case (e.g.

			insights from analytics solution) Decision Support Tool service developer.
EIT Urban Mobility	EIT Urban Mobility is a European network dedicated to enhancing urban mobility through innovation and collaboration of the public and private sector.	Local public-private stakeholder network	Facilitates contact with regional public-private stakeholder network for involvement, dissemination, user workshops, etc.

Organisations outside the local consortium	• PTOs
	  ○ SAEi platform participants (bus fleet operators)
	  ○ ODT and DRT service providers
	• Regional government, municipality and other public actors as stakeholders
	Additional digital service providers to explore use case extensibility		

Use Case 2	
Description	Forecasting system to optimise traffic based on vehicle flow and air quality

Roles and responsibilities			
Name	Description	Role	Responsibility
Eurecat	Eurecat is a non-profit technology centre in Catalonia, conceived with the mission of becoming a key agent in public-private cooperation within the area of research and innovation.	Use case 2 leader, implementation partner, data solution provider	Use case co-design support and technical implementation partner of data space infrastructure for Use Case 2. Development of data services (data consumer).
EIT Urban Mobility	EIT Urban Mobility is a European network dedicated to enhancing urban mobility through innovation and collaboration of the public and private sector.	Local public-private stakeholder network	Facilitates contact with regional public-private stakeholder network for involvement, dissemination, user workshops, etc.

Organisations outside the local consortium	• Barcelona City Council's traffic operations: data owner and provider • Regional Government: complimentary data owner and provider

The **overarching objective** of Barcelona's implementation project is to execute two sets of iterative use cases, serving as pilots for the deployEMDS data space infrastructure, with the aim of enhancing the regional mobility strategy.

The **first use case** focuses on establishing a data space designed to manage diverse bus tracking and monitoring data. This data management occurs across a regional, multi-operator SAEi platform[26] provided by the local public transport authority (PTA), designed to improve the digitalisation and operational efficiency of public transport operators while maintaining their autonomous fleet management.

The **status quo** involves the initial version of the SAEi platform that was deployed at the end of 2023, providing the launching point for the deployEMDS use case objectives and pilot. The current deployment of the SAEi platform provides functionality for operators to manage their fleets with the local PTA (e.g. routes, status, vehicle monitoring, ticket validations). While the platform is scalable in terms of the number of operators that it supports, it does not provide data governance tools or data exchange protocols to connect the operators and platform services to a large ecosystem of regional mobility and data service providers. Examples include third-party decision support tools, optimisation and prediction models, and third-party operator platforms for travellers. It is also primarily focused on fixed routes transport and does not yet include support for the structured data approach for dynamic modes such as Demand-Response Transport (DRT).

The **motivation** of the use case and deployEMDS' data space approach is to evolve the SAEi platform's current state with the following:

- Better integrate On-Demand Transport (ODT) and Demand-Response Transport (DRT) and its diverse data sources and operator systems to complement fixed route transport.
- Improve quality monitoring standards for related mobility services and target scalability, standardisation and harmonisation of data governance and technology including data, concepts and indicators between the different modes of the regional bus system (i.e. fixed routes, ODT and DRT).
- Provide data usage control for participating public transport operators (PTOs) beyond the SAEi platform for third-party services. Of the latter, Nommon is an example of a third-party platform that will participate in the pilot, providing data services and a decision-support tool that also incorporate added-value complimentary data such as Floating Mobility Data (anonymised mobile phone data from mobile network operators).

The city considers the use case **successful** if the enhancement of public transport optimisation can be achieved, particularly in suburban areas, thereby improving connectivity, inclusiveness (e.g. bus transport requests for reduced mobility) and overall efficiency in sustainable mobility. Scalability and interoperability are also targets in terms of adopting data governance standards and tools to connect the SAEi's bus operators to a large ecosystem of third-party services, and the platform itself to large mobility ecosystems.

[26] SAE is "sistema de ayuda a la explotación" in Spanish, the monitoring and tracking system installed on each bus.

The **risks** for this use case include implementation challenges in integrating “connector-based” components on top of existing SAEi platform architecture, as well as dependencies on key actors outside of the consortium, such as a PTO platform user. These risks are being mitigated through collaboration between multiple teams in the PTA (SAEi platform, systems, ticketing, etc.) and SAEi platform developer, and a prioritised outreach to the PTO user in Q1 2024 as part of the implementation plan deliverable.

The **second use case** focuses on traffic analysis and includes external variables. The use case considers the effect of weather conditions on traffic patterns, the impact of traffic on air quality, as well as the development of a traffic prediction model and incident detection model.

Road traffic will be studied at the different measuring points where sensors are installed, both within the city of Barcelona and along the road ring. The analysis will include variables like traffic intensity and the saturation on each lane of the road. These calculations are performed for each hour of the day, each type of day, and each month of the year.

Different parameters related to air quality that will be obtained from the measurement stations will also be studied. Other variables, such as meteorology, will progressively be incorporated to analyse their cross impact.

Once the data is pre-processed, curated and standardised, three services will be developed, trained, and tested using Artificial Intelligence/Machine Learning to generate a traffic prediction model, incident detection model, and air quality impact assessment.

The **status quo** of the current traffic information system reveals a lack of integration between this traffic dataset and other related data sources. It has been designed to provide descriptive indicators of the traffic flow and it is the main information source to regulate the control of traffic lights. Data interoperability is either undeveloped or relies on manual processes. Although a large amount of historical data is available, it does not allow for the correlation of cause and effect between different variables, or the anticipation of predictable situations. Currently, the interpretation of the causes and effects of traffic relies on the experience and knowledge of experts in the field, as it is not integrated with contextual information. This fragmentation makes it difficult to objectively quantify the impact in both directions. Two clarifying examples of great interest would be how traffic affects air quality and the impact of weather on traffic. The traffic measurements are not standardised or publicly accessible through a data space. This situation limits the possibility of comparison with other cities and it is an entry barrier for third-parties willing to build a value proposition on top of this data.

The **motivation** behind this use case is to harness the full potential of traffic data by integrating diverse sources and models. Potential end users of the data product can be citizens for their daily trips, public authorities to optimise, plan and improve operations with positive and sustainable impact, and also technical companies in the mobility industry whose digital products can be improved with the use of the prediction services and also with the datasets. Other sectors, such as commerce, are also interested in using traffic data for their business, for instance, to determine best shop locations.

Successful implementation of the use case involves enhancing accessibility and interoperability of the data, enabling cross-analysis and achieving high accuracy through the implementation of advanced prediction models. Ultimately, this initiative seeks to unlock valuable insights for optimising traffic management and enhancing overall transportation efficiency.

Risks associated with the use case include a critical reliance on the original infrastructure, which may present challenges in deploying connectors or finding alternative mechanisms for data collection. Additionally, specific activity timelines are highlighted, contingent upon the availability of resources.

In addition to harmonised KPIs to compare progress across local implementation projects, the following preliminary **KPIs** have been defined for the implementation in Barcelona:

KPI 2: “Amount and types of data made available in machine-readable format”

- 15% annual increase in data volume published to a central deployEMDS catalogue.
- Datasets in 3 focus areas:
  - Multimodal data: e.g. fixed public and ODT/DRT transport scheduling, operational status, occupancy, transfer time, land use
  - Traffic data: e.g. traffic measuring points, road status, accidents
  - Complimentary data: e.g. floating mobile data, meteorological data, air quality, etc.
- 70% of datasets made available during deployEMDS aligned with NAP requirements.

KPI 3: “Adoption of the common technical infrastructure and governance mechanisms by different types of participants”

- At least 7 data providers integrated into deployEMDS pilots (e.g. transport operator, PTA, traffic authority, mobile operator (FMD data), city open data portals, etc.).
- At least 2 data consumers/service providers integrated (analytics platforms and decision-support tools from Nommon and Eurecat).
- 50 individuals from stakeholder end-user organisations interacting with new data services deployed and demonstrated in data space through trials and workshops, e.g. transport operators, city planners, SME MaaS solution providers, mobility research organisations, etc.
- 12 additional regional public and private stakeholders providing input to governance and operational model of data space deployment.

KPI 4: “Services, products and processes developed or improved due to the use of the common European mobility data space”

- 3 multimodal service innovations developed and enabled through use cases incl. indicators for supply and demand of PT/DRT, demand prediction models for PT/DRT, policy recommendation component for PT/DRT optimisation (and UI for end-users to consume these decision-support tools and analytics services for transportation operators and PTA).
- 3 traffic service innovations incl. traffic prediction model, anomaly detection, and air quality impact assessment (and UI for end-users as decision-support tools and analytics services for traffic operators and city planners).
- New studies provided based on aforementioned innovations: multi-modal related studies (e.g. optimal configuration between PT and DRT) and traffic related studies (e.g. traffic prediction and impact on air quality).
- Improved mobility services based on aforementioned innovations via toolset and prediction models for decision makers to improve the deployment and operation of PT vs. DRT and traffic flows in Barcelona, with development made possible through data space pilots.

KPI 5: “Net gains in environmental performance enabled by the common EMDS deployment project(s)”

Substantial contribution to the development of common prediction models on mode share and emissions and more specifically, estimation of:

- % increase in precision of prediction models for air quality impact assessment in developed decision-support tools for traffic flow, by the end of the project.

- Estimated 5-year forecast % change in emissions (CO2 and other emissions) using modal split and traffic optimisation innovations developed in Barcelona.
- Improved monitoring capabilities relevant for the environmental performance of the city, including, but not limited to, relevant SUMIs. Examples:
  - Multimodal/public transport: Access to mobility services, congestion and delays, opportunity for active mobility, multimodal integration.
  - Traffic: Air pollutant emissions, congestion and delays, traffic safety active modes.

7.2 Budapest

Overall objective	Budapest is committed to the development of its public transport towards multimodal regional ITS by expanding the current BudapestGo.

Use Case 1	
Description	Multimodal connectivity and route planning integration with BudapestGO

Roles and responsibilities			
Name	Description	Role	Responsibility
Urban Institute Hungary	The Urban Institute Hungary (UIH) develops smart city related products and services and implements them in close cooperation with transport companies, industry partners, energy utility providers, central government agencies, municipalities and metropolitan regions in Hungary and beyond across the CEE region.	Local coordinator, use case 1 leader	Coordination of local consortium and use case 1, from definition to implementation. Technical implementation partner of data space infrastructure for use case 1.
BKK (Centre for Budapest Transport)	As the integrated mobility manager of Budapest, BKK is responsible for mobility in Budapest, including the operation and development of public transport as well as the development and implementation of the mobility plan (SUMP).	Data provider, external stakeholder management	Operator of BudapestGO. Data provider Bridge contact with shared mobility providers.
Urban Software Institute	[ui!] is active worldwide and advises municipalities, cities and metropolitan regions on their strategic planning to implement ambitious climate targets, optimise existing and infrastructure, expand new urban more sustainable	Technical partner	Operator of UrbanPulse platform

	mobility concepts and develop new energy concepts in urban areas.		
Organisations outside the local consortium	• Sharing Service provider 1 (MOL Bubi, tbc), data owner • Sharing Service provider 2 (Lime, tbc), data owner • Sharing Service provider 3 (GreenGo Car, tbc), data owner		

Use Case 2	
Description	MaaRLIM – Mobility as a Right for people with mobiLity IMpairment

Roles and responsibilities			
Name	Description	Role	Responsibility
Urban Institute Hungary	The Urban Institute Hungary (UIH) develops smart city related products and services and implements them in close cooperation with transport companies, industry partners, energy utility providers, central government agencies, municipalities and metropolitan regions in Hungary and beyond across the CEE region.	Local coordinator, use case 2 leader	Coordination of local consortium and use case 2, from definition to implementation. Technical implementation partner of data space infrastructure for use case 2.
BKK (Centre for Budapest Transport)	As the integrated mobility manager of Budapest, BKK is responsible for mobility in Budapest, including the operation and development of public transport as well as the development and implementation of the mobility plan (SUMP).	Data provider	Data provider
Urban Software Institute	[ui!] is active worldwide and advises municipalities, cities and metropolitan regions on their strategic planning to implement ambitious climate targets, optimise existing and infrastructure, expand new urban more sustainable mobility concepts and develop new energy concepts in urban areas.	Technical partner	Operator of backend platforms - Urban Pulse, CoVCAP

Organisations outside the local consortium	• Associations for disabled and vulnerable people, data owners, dataset providers

The **overarching objective** of Budapest is to advance its public transport system toward a multimodal regional Intelligent Transportation System (ITS) by expanding the existing BudapestGO app.

The **first use case** focuses on transforming the current route planning system into a multimodal system. This will be achieved by integrating the UrbanPulse open data platform, connecting data from various shared transport operators and other service providers with BudapestGO, Budapest's public transport system.

The **status quo** is that both BudapestGO and UrbanPulse are already established systems. The BudapestGO public transport journey planning and ticketing app currently allows users to plan trips for only public transport vehicles (combined with bicycle trips), but there are no private shared mobility service providers included. The BudapestGO app has been downloaded more than 4.4 million times, and 1.8 million people registered already (40% of ticketing income is realised through the app, selling digital tickets and passes). More than 4 million journeys are planned via the app monthly. Currently, the available shared mobility services (and available shared vehicles) of private companies in Budapest are not visible in the BudapestGO app. Users are not informed through an integrated platform about the mobility possibilities they could use and consider when planning trips, making sustainable options less attractive. Thus, when users want to plan multimodal trips, they have to use multiple apps and calculate routes and add journey times manually (use separate apps for planning: use BudapestGO for public transport route planning; open more shared mobility service providers app to see available scooters or carsharing cars). This multi-app planning process hinders seamless user experience when trying to plan (sustainable) multimodal trips.

The main innovation of this use case lies in the collection, integration and utilisation of shared mobility data from diverse sources.

The **motivation** behind the development of the use case is the evolution of its public transport toward multimodal regional ITS by expanding BudapestGO. The use case is considered **successful** with the integration of data from at least three shared mobility providers into BudapestGO, with the ideal scenario being the integration of all existing providers and preparedness for new ones.

Budapest acknowledges the potential **risk** that service providers may be hesitant to embrace a higher level of integration, fearing a potential loss of customers.

The **second use case** focuses on extending MaaRLIM, Mobility as a Right for people with mobiLity IMpairment, which integrates with CoVCAP (Coordinating Volunteers supporting COVID-19 affected Persons) services through integration with EMDS. Vulnerable individuals can make requests via phone to the operator in a call centre. The operator manages users and their requests through the CoVCAP system, utilising a matchmaking algorithm to connect volunteers who offer assistance to vulnerable individuals using public transport.

The **status quo** of this use case encompasses the existing CoVCAP system, initially developed with the support of Urban Mobility KIC in response to the increased demand for transport support during the COVID-19 pandemic, which has proven effective. In the past, a demonstrator system was implemented that comprises of the setup of a call centre and a dispatcher agent. This backend service was connected to a dataset of fictional volunteers and was provisioned through an openly available domain. Although the service

was demonstrated to be fully functional, it has never been used actively by the community in Budapest due to changing environmental circumstances.

Budapest is driven by the **motivation** to empower vulnerable demographics, including the elderly, disabled, ill, and those in quarantine, to meet their mobility needs. This empowerment is facilitated through collaboration with both professionals (employees of transport companies) and volunteers (including social services, charities, and private individuals). By seamlessly integrating with EMDS mobility data sets, the aim is to provide services on a larger scale. **Success** for the use case is defined by fostering social solidarity and ensure mobility as a fundamental right for all. With CoVCAP, the use of public and shared transport will be combined for those who cannot use transport without assistance provided by social workers and voluntary charities. The success can be measured precisely in terms of the increase in the number of disadvantaged people using transport services and the number of volunteers involved in helping them.

Identified inherent **risks** are associated with CoVCAP and MaaR setup:

The key issue is a lack of trust. People with mobility impairments may be more sensitive and hesitant to reach out or accept help from unfamiliar individuals. One of the advantages of CoVCAP is that it can build trust between people, similar to the relationships built between citizens and police officers. Therefore, the key to building trust is that volunteer helpers are also entered into the registration database after careful screening and training. Of course, this database also contains sensitive personal data, so GDPR compliance and IT security are essential.

In addition to harmonised KPIs to compare progress across local implementation projects, the following preliminary **KPIs** have been defined for the implementation in Budapest:

KPI 2: “Amount and types of data made available in machine-readable format”

- 2 datasets available from transport service providers in the deployEMDS catalogue.

KPI 3: “Adoption of the common technical infrastructure and governance mechanisms by different types of participants”

- 3 integrated separate transport service providers for the multimodal connectivity and route planning integration with BudapestGO use case
- Involvement of 2 associations for people with physical disabilities as stakeholders in the MaaRLIM use cases to enable the integration of individual and volunteer transport offers.

KPI 4: “Services, products and processes developed or improved due to the use of the common European mobility data space”

- 2 new features available in the BudapestGO app (e.g., multimodal planning).
- 100 registered users with physical disabilities on the platform.
- 1.5 million registered users of BudapestGO using e.g., functions with the newly integrated transport service providers (baseline 1.2 million).
- 3.5 million planned journeys per month in BudapestGO (baseline 3 million).

KPI 5: “Net gains in environmental performance enabled by the common EMDS deployment project(s)”

Substantial contribution to the development of common prediction models on mode share and emissions and specifically:

- Number of new trips using shared (sustainable) modes and their effect on mode share and emissions.
- Improved monitoring capabilities relevant for the environmental performance of Budapest's transport system, including relevant SUMIs:
    - Multimodal/public transport: Multimodal integration
    - Traffic: Congestion and delays

7.3 Flanders

Overall objective	Flanders aims to connect the Flanders smart data space with the EMDS to enable cross-border applications and to enhance the Flanders smart data space with (EMDS) building blocks to lower the threshold for data prosumers.

Use Case 1	
Description	Optimising the (re)-use of traffic measurements

Roles and responsibilities			
Name	Description	Role	Responsibility
imec	Imec, a for-profit company, is a world-leading R&D and innovation hub in nanoelectronics and digital technology.	Local coordinator, use case leader	Coordination of local consortium and use case, analyse requirements, adapt and implement WP2 infrastructure in local pilot, quality assessment, stakeholder management.
Digitaal Vlaanderen	Digitaal Vlaanderen is in the public sector and a digital agency for regional Government.	Use case implementation partner	Use Case implementation (connecting VSDS to EMDS) and analyse requirements, define data projects, quality assessment, stakeholder management.

Organisations outside the local consortium	• Different data owners / providers to publish data
	  ○ some final agreements, some verbal agreements
	• Data consumers
	  ○ contacts and interest for onboarders		

	• Other pilot site within EMDS to exchange traffic measurements data

The **overarching goal** of the implementation project is to integrate the Flanders smart data space, and more specifically the Data Space Traffic Measurements (which is part of the Flanders smart data space), with EMDS, fostering cross-border applications. Additionally, the aim is to enrich the Flanders smart data space with EMDS building blocks to streamline the data prosumer experience.

The Flanders use case will scope on the integration and sharing of traffic measurements (i.e., traffic count data sources). The **status quo** within this domain (or regarding these data sources) is the following: currently, different entities measure traffic using a wide range of technologies. However, the resulting traffic measurements are not shared or standardised. The Flemish use case is **motivated** by the current fragmented traffic measurement landscape, where a multitude of disparate methods and standards exist for data exchange, often occurring bilaterally or ad hoc, or through centralised hubs. In the context of traffic measurements, this fragmentation results in data being confined within silos. More than 500 entities employ traffic measurements based on diverse technologies with proprietary protocols, hindering data re-use. The prevailing linear and closed value chain from sensor producers to data analysis exacerbates this challenge. Therefore, the Flanders use case focusses on optimising the re-use of traffic measurements. **Success** hinges on the realisation of this connectivity to the EMDS to facilitate cross-border applications and enrich the Flanders smart data space. To reach this goal, Flanders will focus on several data space building blocks:

- Standardisation. To ensure comprehensive data transfer between data space participants, a standardised data model and transferring protocol for traffic measurements is necessary. This need is even higher for cross-border data transfer (which will be the result of deployEMDS). This standard must be applied within procurement processes of different data owners and implemented within the platforms of different data providers and consumers. The status quo is that in the Flanders smart data space the OSLO traffic measurements data model and LDES (Linked Data Event Stream) transferring protocol is designed, but the implementation ensuring a standardised data transfer between participants, needs to be rolled out.
- Infrastructure. The exchange of data requires an interface that can be rolled out on the infrastructure of the different actors. The status quo is that a first data provider of the Flanders smart data space has an LDES server from which the data is transferred. An EDC connector is currently being developed to connect to the Flanders Smart data space. Within the deployEMDS project, Flanders aims to develop a no code / low code interface to support the data re-use by less technical data users.
- Ecosystem. A collaborative ecosystem must be set up to leverage the re-use and integration with data consumers and data users. A future-proof approach requires the establishment of a clear governance structure. The status quo is the onboarding of the first data providers. However, additional publishers and consumers are necessary.

Acknowledging potential **risks**, Flanders is cognisant of challenges related to customer onboarding and deployment of data space building blocks. Up until now, the focus of the Flanders smart data space was on data providers, but the success of this use case hinges on the involvement of data consumers. The identification and onboarding of data consumers is therefore identified as a risk for the Flanders use case. This will be mitigated by lowering the threshold for new participants and aiming to make the data space as accessible as possible.

In addition to harmonised KPIs to compare progress across local implementation projects, the following preliminary **KPIs** have been defined for the implementation in Flanders:

KPI 2: “Amount and types of data made available in machine-readable format”

- 3 real-time interoperable streaming data services from traffic sources (currently only 1 is available in a customised interface).
- 10 public, private and citizen multimodal datasets: e.g., traffic data from highways, bike data from regional roads, mixed mobility data from local governments or cities, up to 4 companies providing traffic and mobility monitoring services, Telraam delivering traffic monitoring data from their community, etc. Currently only 3 data sets are available in different functional protocols and different technical interfaces.
- From the 10 data streams, at least 4 data streams or new and newly available compliant with ITS Directive. No envisioned datasets are currently part of the Belgian NAP. Traffic measurements is currently not considered as relevant NAP data, while this project aims to add these data sources on the NAP.

KPI 3: “Adoption of the common technical infrastructure and governance mechanisms by different types of participants”

- At least 10 registered use case data owners, data intermediaries and data users.
- At least 3 end-to-end ecosystem implementations from data source, data space and data user, incl. one cross-border implementation in the Benelux, a rulebook and data contract implementation, publishing of data using industry standard Oslo Mobility SEMIC.

KPI 4: “Services, products and processes developed or improved due to the use of the common European mobility data space”

- 3 data space component service innovations, including features that enable the consumption and integration of different data sources with existing apps in Flanders and cross-border.
- At least 2 optimised data space services.
- A smart contracting feature for curated data flow.

KPI 5: “Net gains in environmental performance enabled by the common EMDS deployment project(s)”

- Contribution to common prediction models on mode share and emissions.
- Improved monitoring capabilities relevant for the environmental performance of the region, including relevant SUMIs:
    - Monitoring of Access to mobility services
    - Multimodal integration

7.4 Île-de-France

Overall objective	Île-de-France wants to help companies to keep their employees tackle commuting mobility challenges, implement their sustainable mobility policies, and reduce environmental impacts caused by commuting.

Use Case 1	
Description	MaaS for Companies – MaaS app facilitating the attribution of sustainable mobility credits to employees to tackle the region’s commuting challenge.

Roles and responsibilities			
Name	Description	Role	Responsibility
Instant System	Instant System is a MaaS provider company, offering digital solutions for mobility for cities and regions.	Local coordinator, use case 1 leader	Coordination of local consortium and use case 1. Deployment of its MaaS for companies solution and integrator of the mobility data provided, including EV charging stations.
EONA-X	Eona-X is an operational data space for the mobility, transport and tourism sector. Its technical platform is compliant with Gaia-X principles. Additionally, Eona-X is recognised as a Gaia-X lighthouse project.	Data space federator	Federation of mobility data provider stakeholders, provider of data from EONA-X stakeholders through the data space. Connection of the EONA-X dataspace to the EMDS.
enRoute	enRoute provides data management solutions for public transit and shared mobility.	Transit data quality management	Data quality assessment.
Organisations outside the local consortium	• EONA-X stakeholders, data owners		

Use Case 2	
Description	Journey planner optimisation – exploitation of journey planner use data for cities and MaaS providers' needs.

Roles and responsibilities			
Name	Description	Role	Responsibility
Instant System	Instant System is a MaaS provider company, offering digital solutions for	Local coordinator, use case 2 leader	Coordination of local consortium and use case 2.

	mobility for cities and regions.		Provider of MaaS usage data.
EONA-X	Eona-X is an operational data space for the mobility, transport and tourism sector. Its technical platform is compliant with Gaia-X principles. Additionally, Eona-X is recognised as a Gaia-X lighthouse project.	Data space federator	Federation of mobility data provider stakeholders, provider of data from EONA-X stakeholders through the data space. Connection of the EONA-X dataspace to the EMDS.
enRoute	enRoute provides data management solutions for public transit and shared mobility.	Transit data quality management	Data quality assessment.
Organisations outside the local consortium	• Cities/transport authorities, data owners		

The **overall objective** of Île-de-France (IDF) is to tackle traffic congestion and environmental challenges caused by commuting. The use case aims to assist companies in retaining their employees, addressing commuting mobility challenges, managing sustainable mobility policies, and reducing environmental impacts induced by commuting.

The **first use case** centres on developing a Mobility as a Service (MaaS) solution for enterprises, named Emy. This solution facilitates the management of companies' mobility policies, specifically the "Forfait Mobilités Durables" (FMD), which is a key measure outlined in the Mobility Orientation Law (LOM) of December 24, 2019.

The **status quo** consists of the substantial challenges posed by commuting in Île-de-France, the country's first employment area. The region accounts for 2% of the country's surface area but is home to 18% of France's population and accommodates more than 12 million daily commuters, with significant flows from the suburbs to Paris and vice versa. 49% of the commuters tend to use their cars, facing road congestion that increases commuting time – a significant factor affecting well-being at work. Thus, commuting not only has environmental impacts, but also presents challenges for talent retention among employers. In France, employers must consider sustainable mobility planning, and are encouraged by the LOM law to provide their employees with FMD – up to untaxed 800€ per employee to be spent for green mobility expenses. Instant System proposes a solution facilitating the management of the FMD according to the company's mobility policy, minimising HR costs and providing a dedicated payment system for employees to spend their allocation. The solution consists in a MaaS application embedding a payment card and a journey planner, providing passengers with information on available mobility options to commute between home and the workplace. The solution, named (Emy), is designed to encompass all alternative mobilities available to commute, ranging from public transport to shared mobility and electric vehicle (EV) facilities.

Currently, the status quo indicates room for improvement in terms of data provided to address the challenges faced by employers in Île-de-France (IDF), such as the need for electric vehicle (EV) charging stations and traffic information. Additionally, there is also a lack of harmonised framework to reference and share the data

regarding EV charging stations, a topic that is being addressed by the recent EU Alternative Fuels Infrastructure regulation[27] and the resulting delegated acts.

The **motivation** behind this use case is to assist companies in retaining employees, addressing commuting mobility challenges, managing sustainable mobility policies, and reducing environmental impacts induced by commuting. Additionally, the aim is to incentivise the deployment of sustainable mobility policies in enterprises, enable multimodality to tackle these challenges and enrich the data space catalogue with used data, making it reusable by other parties. **Success** will be determined by onboarding three pilot sites from Île-de-France using Emy through the implementation of this use case. The major **risks** for the implementation of the use case are the following:

- Failure in the identification of companies already or willing to implement the Forfait de Mobilité Durable scheme into their companies. To mitigate this risk, EONA-X, which brings together more than twelve organisations, including large corporations, will support Instant System by promoting the solution to its member companies.
- The data sources to be integrated are not standardised. Stakeholders will refer to the IRVE reference frame (TBD depending on the evolution of the EU regulatory framework and of the use case).

The **second use case** focuses on optimising the journey planner by feeding the algorithm with journey planner user data to enhance the results of itinerary research based on user behaviour. Improved journey planner results imply increased usage of public transport (PT) modes and sustainable mobility options, as the journey planners are PT-centric.

The **status quo** of the journey planner/MaaS applications delineates the generation of valuable user data that are currently underutilised. The daily use of a network's journey planner generates a huge amount of "usage" data, providing information on the use of the network, the user's behaviour and preferences in terms of modes and choices made, CO2 savings, and more. Exploited and analysed, these data represent crucial information for the PTA/PTO, mobility planning, congestions predictions, smart city platforms, digital twins, adjustments of the PT network, but also for SUMP reporting. For MaaS providers, this data can be used to train their journey planner algorithms and optimise their results and increase their relevance based on users' behaviour.

The **motivation** behind this use case is to make data standardised and interoperable so that cities can analyse and compare user behaviour with other cities, and MaaS providers can conduct research and development to improve the performance of journey planners. A **successful** use case will enhance the performance of the itinerary calculator.

The associated **risk** lies in the non-consent of cities to share data. Currently there is legal uncertainty about who has the ownership of the data generated by the journey planners. To mitigate this risk, the project will work with the cities to define a data sharing scheme, including specifying the essential data they would be willing to share and to promoting the benefits that they would derive from the use of such data.

[27] Regulation (EU) 2023/1804 of the European Parliament and of the Council on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32023R1804.

In addition to harmonised KPIs to compare progress across local implementation projects, the following preliminary **KPIs** have been defined for the implementation in Île-de-France:

KPI 2: “Amount and types of data made available in machine-readable format”

- 200 data sets made available through the EMDS by the end of the use case implementation in the categories static public transport data, real-time PT data, MSP data, demand-related and usage data, flight data.
- Around 50% of datasets from the local use case available on deployEMDS central components ready to feed the NAP.

KPI 3: “Adoption of the common technical infrastructure and governance mechanisms by different types of participants”

- data sets providers.
- 3 end-user organisations
- At least 5 regional participants registered and integrated into the use cases, e.g., MaaS provider, data quality SaaS provider, the regional authority and the public transport authority, a data intermediary.
- Integration with an existing data space in France (i.e. EONA-X).

KPI 4: “Services, products and processes developed or improved due to the use of the common European mobility data space”

- At least one market innovation developed.
- At least two improved services, incl. improved passenger information and improvement of intermodal route planning.

KPI 5: “Net gains in environmental performance enabled by the common EMDS deployment project(s)”

Contribution to common prediction models on mode share and emissions and measurement of the two generic KPIs under KPI 5 and specifically:

- Amount of CO2 (tons) saved by the users using the new service, compared to car use, over the duration of the use case.
- Improved monitoring capabilities relevant for the environmental performance of IDF region, including relevant SUMIs:
    - Multimodal/public transport: Access to mobility services and greenhouse gas emissions

7.5 Lisbon

Overall objective	Lisbon aims to facilitate data sharing for actionable intelligence, enhancing route planning for people with reduced mobility and making public transportation more competitive and aligned with urban environmental and sustainability goals.

Use Case 1	
Description	Enhancing seamless route planning

Roles and responsibilities			
Name	Description	Role	Responsibility
Emel – Empresa Municipal de Mobilidade e Estacionamento de Lisboa	EMEL - Lisbon's Municipal Company for Mobility and Parking, is the operational arm of the Lisbon city council for urban mobility. It is currently responsible for the regulation of on-street parking, 39 Car Parks, the public BSS; the cycle network infrastructure; an EV charging network; a safe bicycle park network, the management of the traffic lights system and several escalators and elevators operating in the city.	Local coordinator, use case 1 leader, data provider	Coordination of local consortium and use case 1. Data provider.
Organisations outside the local consortium	• NGOs representative of people with reduced mobility, identification of the specific needs of this population • The Lisbon's City Council, holds data on public space (traffic signs; bus stops, streetlights etc.) • JC Decaux, holds data on its outdoor advertising equipment (public space barriers) in the city of Lisbon • Others public actors, involved as stakeholders.		

Use Case 2	
Description	Increasing the attractiveness of alternative mobility solutions

Roles and responsibilities			
Name	Description	Role	Responsibility
Emel – Empresa Municipal de Mobilidade e Estacionamento de Lisboa	EMEL - Lisbon's Municipal Company for Mobility and Parking, is the operational arm of the Lisbon city council for urban mobility. It is currently responsible for the regulation of on-street parking, 39 Car Parks, the public BSS; the	Local coordinator, use case 2 leader, data provider.	Coordination of local consortium and use case 2. Data provider.

	cycle network infrastructure; an EV charging network; a safe bicycle park network, the management of the traffic lights system and several escalators and elevators operating in the city.		
Organisations outside the local consortium	• Mobility services providers (tbc), data owner • MaaS platform provider (tbc), technical MaaS solution • Payment service provider (tbc), payment services • Corporations with headquarters in Lisbon		

Use Case 3	
Description	Increasing schedule reliability and/or commercial speed of buses

Roles and responsibilities			
Name	Description	Role	Responsibility
Transportes Metropolitanos de Lisboa (TML)	TML - Lisbon's Metropolitan Transportation Authority is the PTA of the intermunicipal bus operation within the 18 municipalities in the Lisbon Metropolitan Area, plus the municipal operation in 15 of them. TML is also responsible for the management of the entire intermodal ticketing system, as also for the unique fare scheme and its financial distribution.	Use case 3 leader	Coordination of local consortium and use case 3. Data provider.
Organisations outside the local consortium	• Bus operators and municipalities/PTA, data owners and data consumers • Third party apps, data consumers		

Lisbon is committed to fostering data sharing for actionable intelligence, improving route planning for individuals with reduced mobility, and enhancing the competitiveness of public transportation, aligning with urban environmental and sustainability **objectives**.

The **first use case** centres on seamless navigation, aiming to unlock data contributing to reliable door-to-door navigation for people with reduced mobility (PMR) and providing decision-makers with information on accessibility barriers and verified mobility service accessibility.

The **status quo** is that data is siloed and underused, presenting a major challenge for the City of Lisbon. The issue is even more challenging regarding the underuse of existing data and information on accessibility barriers identification and verified information on the accessibility conditions of public spaces, particularly on accessibility for people with reduced mobility (PRM) in their door-to-door journeys. Therefore, better identification, generation and sharing of this data will enable actionable intelligence for improved decision-making processes and the creation of more people-centric mobility solutions, that effectively answer the needs of these particularly underserved users.

The focus of the use case is twofold: explore access barriers to EMEL services and investigate the barriers created by EMEL's assets in the City of Lisbon.

From previous studies, a significant set of EMEL´s data has already been identified, harmonised according to European standards (when applicable) and made available either in its data portal and/or through the NAP. Examples include, but are not limited to, cycle lanes, on-street regulated parking spaces, electric vehicle charging stations. EMEL also mapped the gross sidewalk width of all of Lisbon's streets, which provides important information on the pedestrian accessibility of Lisbon. However, additional information still needs to be identified, mapped, generated, and harmonised, either through EMEL's services or from other sources. The project will undertake this task in close collaboration with the community of PRM, the Municipality, and other important stakeholders.

Motivated by the increasing share of city users with reduced mobility, the goal is to continue filling the gap in underused data, to generate relevant data for this demographic and share the data in a machine-readable format. **Success** revolves around the use case's ability to unlock data sharing for actionable intelligence, contributing to improved PRM route planning.

Risks include incomplete mapping of public space barriers, requiring the generation of a massive volume of new data, as the information needed is dynamic and changes frequently.

The **second use case** aims to increase the attractiveness of alternative mobility solutions to reduce car use in work commuting and business travel. Opportunities will be identified to improve the provision of mobility services, foster a more accessible data ecosystem, and create a Mobility-as-a-Service (MaaS) solution with a focus on the corporate segment.

The **status quo** reveals that companies are indirectly contribute to a large share of Lisbon's traffic through to employee commuting. Despite the availability of more flexible working schemes, commuting from further outside the city centre (due to increased rents and cost of living), is leading to more traffic. In Portugal, and particularly in Lisbon, there is a strong culture of providing company cars as part of compensation and benefit packages for mid-senior roles, which bolsters the cycle of car usage to the detriment of other more sustainable transport modes.

Therefore, this use case intends to work on the development of a MaaS solution targeted at the corporate segment. The first approach involves integrating EMEL´s services offering (bundles, subscription, etc.), and in subsequent second stage integration will expand to other services provided by third parties (e.g. CARRIS, Lisbon's bus and tram company and TML, the metropolitan transport authority), and finally other private mobility operators (e.g. micromobility, ride-hailing companies, etc.).

The use case will address key operating and technological challenges: ensuring interoperability of systems (to access and process data from multiple service providers), defining appropriate tariff and income schemes

and value packages and incentives underpinned by the Lisbon's mobility policies rather than strictly driven by the market.

In the first phase the implementation, a design-thinking approach will bring the users (employers and employees) to the centre of the value proposition creation process. In the second stage, EMEL will procure a supplier to implement the functional requirements identified on the first phase through a process of liaising with the different mobility operators.

The **motivation** behind the use case is citizens' continued reliance on private cars, companies indirectly contributing to city traffic and large employers that can impact the mobility paradigm shift. The use case is considered **successful** if a piloting MaaS solution can be implemented in at least one corporation.

The anticipated **risks** are challenges in developing a trustworthy data-sharing governance model.

The **third use case** concentrates on increasing the schedule reliability and/or commercial speed of buses. Lisbon will map and characterise critical public transport route paths where different modes of transport conflict, resulting in low bus speeds and/or disturbances. Machine-readable data should be published to improve bus operation efficiency and minimise impacts on passengers. This will require the implementation of automatic quality control procedures, treatment algorithms, and the deployment of dashboards, APIs, and data infrastructure to facilitate access and data sharing among stakeholders (PTOs, police forces, municipalities, urban planners, etc.

The **status quo** is a lack of an integrated database to analyse and identify where busses lose speed compared with the schedules and an optimal free-flow situation. The current situation relies on data sources of differing quality and formats, analysed on a case-by-case basis, triggered by passenger complaints. The existing methods do not allow, with a reasonable human effort, to rank disturbances by severity to prioritise interventions to minimise the corresponding impact on passengers' travel experience and reduce bus operation costs.

The **motivation** for Lisbon to develop the use case is to improve the reliability of bus supply and promote public transport demand, as well as optimise the efficiency of bus operations across territories and operators to allow for better allocation of resources. At the same time, the aim is to make public transportation more competitive and contribute to urban environmental and sustainability goals through a smoother bus operations and increased demand.

Lisbon considers the use case **successful** if Carris Metropolitana, other PTOs and the relevant municipalities can identify bus routes with most severe disturbances in a simplified and quick process, allowing them to define a prioritised roadmap of the route paths requiring intervention.

Risks include a lack of reliable and consistent data with limited insights value, and low engagement from other bus operators and municipalities, undermining the benefits of the produced information.

In addition to harmonised KPIs to compare progress across local implementation projects, the following preliminary **KPIs** have been defined for the implementation in Lisbon:

KPI 2: "Amount and types of data made available in machine-readable format"

- 10 datasets incl. static and dynamic data (e.g., availability, pricing) of mobility services made available through deployEMDS with metadata descriptions.
- 4 datasets on the location and services description (e.g., bike-sharing service, metropolitan Bus stops, etc.) in compliance with the ITS Directive ready for inclusion in the Portuguese NAP.
- Over 200 operation plans published and ready for NAP.

- stop lists published and ready for NAP.
- Approx. 8e6 real-time registries published and ready for NAP.
- new datasets made available as a direct result of the use cases.

KPI 3: “Adoption of the common technical infrastructure and governance mechanisms by different types of participants”

- 3 entities/operators registered as data providers.
- Approx. 50 000 data requests.
- 2 signed agreements to promote dataset usage.
- At least 50 communication actions.

KPI 4: “Services, products and processes developed or improved due to the use of the common European mobility data space”

- 2 solutions available to operators/service providers and/or public users.
- 3 processes replaced by best practices identified in deployEMDS.
- 4 apps using deployEMDS data.
- 3 API/web services available and supported by published datasets.
- At least 200 users and at least 2 entities adopting the use case solutions.
- 5pp improved passenger satisfaction using Carris Metropolitan services.
- 50 actors with improvements in their services (e.g., police, fire department, municipalities).
- Improved guidance for sustainable mode choices: Information on the modes of transport available and facilities for switching from one mode of transport to the other are to be collected from representatives of local public transport companies, or organising authorities in charge of transport, transport planning and parking.

KPI 5: “Net gains in environmental performance enabled by the common EMDS deployment project(s)”

Contribution to common prediction models on mode share and emissions and specifically estimation of the following indicators for the use case improving bus circulation (3):

- 3% reduction of Joule/vkm on intervened bus routes.
- 3% reduction of CO^2/vkm on intervened bus routes.
- Reduction of CO^2/pkm on intervened bus routes.
- The use cases are expected to contribute to the overall objective of 15% decrease on average in car use for work commuting and business travel in Lisbon.

7.6 Milan

Overall objective	Milan aims to develop a decision support system enabling more effective planning of local public transport services and exploring how user mobility behaviour will change with a fully developed MaaS.

Use Case 1	
Description	Decision support system for local public transport services planning

Roles and responsibilities			
Name	Description	Role	Responsibility
Cefriel	Cefriel is a non-profit company and centre of excellence in innovation, research and training in the ICT sector.	Local coordinator	Coordination of local consortium. Collecting requirements for WP2 and WP3 from the use case and promote application of WP2 and WP3 results to the use case.
ATPL	The Local Public Transport Agency of the Metropolitan City of Milan, Monza and Brianza, Lodi and Pavia is a non-economic public body that has the task of planning, regulating and controlling local public transport, and the relative quality standards of the services offered.	Use case 1 leader, data provider	Coordination of use case 1 development and technical implementation.
Organisations outside the local consortium	• LPT operators • Area and corporate mobility managers • Universities and educational institutions • Cities, Public transport authorities		

Use Case 2	
Description	MaaS-based mobility scenarios

Roles and responsibilities			
Name	Description	Role	Responsibility
Cefriel	Cefriel is a non-profit company and centre of excellence in innovation, research and training in the ICT sector.	Local coordinator	Coordination of local consortium. Collecting requirements for WP2 and WP3 from the use case and promote application of WP2 and WP3 results to the use case.

AMAT	AMAT is an in-house company owned 100% by the municipality of Milan. AMAT provides services to support municipal functions related to planning, programming, design, management, monitoring and control pertaining to land and green development, urban planning, mobility and public transport, road and facility parking, road safety and environmental resources.	Use case 2 leader, data provider	Coordination of use case 2 development and technical implementation. Data provider.
Organisations outside the local consortium	• Municipality of Milan • Sharing mobility operators • LPT operators		

Milan aims to develop a decision support system (DSS) for more effective planning of local public transport (LPT) services and to explore changes in user mobility behaviour with a fully developed Mobility as a Service (MaaS).

The **first use case** focuses on optimising the LPT network and services through the development of a DSS and integrating multiple data sources to build algorithms and analysis models. The DSS will allow the evaluation of the efficacy and efficiency of LPT planning alternatives against a set of identified objectives.

The **status quo** reveals a lack of a unified system for optimising the planning of LPT services and for supporting regulators to standardise and, thus, better compare proposed policies. The current workflow relies on different data sources in different formats for mobility demand data. Examples include but are not limited to: home-to-school, home-to-work, on-board surveys of LPT users, the Lombardy Region's own origin-destination matrix and sales data of LPT tickets and subscriptions. Some of these sources have different data structure and quality based on their reference territory, since ATPL manages LPT services in 4 different provinces and over 20 LPT contracts. Moreover, this fragmentation applies similarly to LPT network's data and the processes for planning and authorising transport services. The main consequence is that the ATPL planners' tasks are more labour-intensive than they could be, as they rely on this multitude of data formats.

Milan's **motivation** for a data space approach is rooted in the spatial nature of LPT services, aligning with the city's mobility demands. The DSS aims to evaluate alternatives related to mobility demand, service costs, and environmental sustainability. Milan considers the use case **successful** when it achieves KPI targets for data quantity and quality/reliability as well as increasing the number of users (e.g., cities, public transport authorities, mobility service providers, SMEs) interested in using the DSS.

Anticipated **risks** include data interoperability issues and compatibility issues with existing service contracts. The data interoperability issues refer to the different data formats adopted by LPT operators' systems and the different sources for the travel demand data. The risks will be mitigated by fostering the adoption of standards and promoting innovative data conversion tools. The compatibility issue with existing service contracts is for sure a problem in the very short term but will be mitigated in the near future. This project comes at an important time for ATPL, as it is preparing the tender for the new LPT contracts. This means that the adoption of actual and future standards can be added as a base requisite for the new contracts proposals, consolidating data formats and processes.

The **second use case** focuses on modelling future mobility scenarios for carbon neutrality with a fully developed Mobility as a Service (MaaS). These scenarios will support envisioning a city where zero-emission mobility is the norm, and citizens can access various sustainable transportation options through MaaS systems. The assumption of each scenario will be the availability of:

- Intuitive and interconnected MaaS applications: Citizens can access MaaS applications that integrate all available transportation options, including public transport, shared bicycles, electric scooters, car-sharing, and ride-sharing services. The apps provide real-time information on routes, schedules, availability and costs.
- Efficient and eco-friendly public transport: Public transport has an extensive network of trams, tube, and zero-emission buses. Thanks to integration with the MaaS apps, citizens can efficiently plan their journeys using public transport, avoiding unnecessary waits and minimising travel times.
- Shared bicycles and electric scooters: The streets are equipped with safe bike lanes, and users can access a vast network of shared bicycles and electric scooters. These vehicles are easily accessible via the MaaS apps and offer a convenient and sustainable way to get around the city, especially for short trips.
- Zero-emission car-sharing and ride-sharing: Citizens can book shared electric cars or zero-emission ride-sharing services through the MaaS apps. These options offer flexibility and convenience for city travel while reducing environmental impact.
- Incentives for sustainable mobility: The city offers incentives to encourage the adoption of zero-emission transportation options and the use of MaaS services. These incentives may include discounts on public transport fares and promotions for using car-sharing and ride-sharing services.
- Traffic reduction schemes: Congestion charges and road pricing schemes allow limited car usage in urban areas by encouraging citizens to opt for more sustainable transportation alternatives such as public transport, bicycles, or electric scooters. Those disincentives are fair since accessible and reliable transportation alternatives are available to all citizens.

In these scenarios, zero-emission mobility is not just an option but becomes the natural choice for citizens, thanks to the ease of use, convenience and incentives offered by MaaS systems and the pricing schemes for car usage. Zero-emission mobility reduces air pollution and the city's overall environmental impact, improving the quality of life of its inhabitants.

An interactive exhibition will detail the outputs of the modelling analysis of MaaS-based future mobility scenarios to citizens to gather their feedback. This feedback will support the refinement of envisioned future mobility scenarios, thereby supporting the planning and development of a mobility transport system targeting carbon neutrality.

The **status quo** highlights that the under-development of MaaS solutions is not considered in the urban mobility planning of the transport system. The main problem faced in planning the transportation system in Milan's city area is the low speed of buses and trams due to traffic and congestion, which affects both the quality of service for users and the operational cost of the local public transport system. At the same time, currently, it is difficult to define and introduce fair access rules like pricing schemes to improve the mobility system. Without adequate alternative options, such measures could negatively affect those citizens who cannot afford the proposed pricing for car usage and lack suitable transportation alternatives.

Moreover, the current information on users' mobility (e.g. destination and origin of each trip and means of transport used) reflects only the status quo. This is useful for incrementally improving the mobility offering but does not allow for the evaluation of entirely new scenarios based on different assumptions about the mobility options and citizens' behavioural changes in a future mobility system.

Success for the use case is defined by accessing various data sources to define MaaS-based future mobility scenarios and understand how user behaviour changes with MaaS development and its impact on urban mobility planning while also considering the effectiveness and efficiency of different scenarios in terms of their economic sustainability. Success is defined by reaching KPI targets, defining valuable mobility scenarios, and having active participation of citizens in the exhibition.

Risks include the performance of defined MaaS-based scenarios and limited citizen engagement in the exhibition. The risks of low-quality/performance scenarios will be mitigated by adopting best practices for MaaS-based solutions already available in European cities. The risk of limited citizen engagement will be mitigated by promoting the interactive exhibition using different communication channels (e.g., flyers, newsletters, social media, and websites).

In addition to harmonised KPIs to compare progress across local implementation projects, the following preliminary **KPIs** have been defined for the implementation in Milan:

KPI 2: “Amount and types of data made available in machine-readable format”

- Approx. 30 datasets (e.g., scheduled transport services, home-to-work mobility surveys, home-to-school mobility surveys, on-board passenger counts) published in the EMDS and regulated by specific policies.
- Approx. 5 data products made accessible to stakeholders through the EMDS.
- All datasets published in the EMDS that match the NAP requirements on static mobility data will be made available in compliance with the EU standard NeTEx.

KPI 3: “Adoption of the common technical infrastructure and governance mechanisms by different types of participants”

- 50 stakeholders both potential data providers and consumers made aware of datasets available in the EMDS.
- stakeholders (mobility companies, service/MaaS providers) participating in the EMDS with a dedicated connector and acting both as data providers and data consumers.
- Approx. 200 data requests received.
- 20 local stakeholders involved in dedicated events for the dissemination of best practices for data-sharing governance.

KPI 4: “Services, products and processes developed or improved due to the use of the common European mobility data space”

- 30 new mobility scenarios analysed.
- 5% improvement in the level of service of the planned public transport (access time, waiting time, travel time, reliability, etc.).

KPI 5: “Net gains in environmental performance enabled by the common EMDS deployment project(s)”

Contribution to common prediction models on mode share and emissions and specifically, related to sustainable mobility scenarios (2):

- At least 150 of stakeholders, citizens and public authorities involved in the evaluation of MaaS-based future mobility scenarios in events dedicated to sustainable mobility awareness.
- Improved monitoring capabilities relevant for the environmental performance, including relevant SUMIs.

7.7 Sofia

Overall objective	Growing traffic flows have resulted in congestion and traffic jams becoming an everyday occurrence in Sofia. Mobility data sharing and especially delivering journey planners involving public transport and green shared mobility will enable the reduction of traffic and thus contribute to a better living environment.

Use Case 1	
Description	Connected Green & Shared Mobility Journeys (GreenMob)

Roles and responsibilities			
Name	Description	Role	Responsibility
GATE	GATE is the first Big Data and AI CoE in Eastern Europe, established as a joint initiative between Sofia University, Bulgaria, Chalmers University of Technology and Chalmers Industriteknik, Sweden. Being a national hub of IDSA, it initiated the first Urban Data Space in the region.	Local coordinator, use case 1 leader	Coordination of local consortium and use case 1. Collecting requirements for WP2 and WP3 from the use case and promote application of WP2 and WP3 results to the use case. Deployment of data space components.
Sofia Urban Mobility Centre	Sofia Urban Mobility Centre (SUMC) is responsible for the organisation, management, supervision and financing of the public transport system in Sofia as well as for the short-term paid parking zones in the city.	Data provider, local engagement of stakeholders and use case adoption	Coordination of data sharing from public transport and shared mobility operators.
Sofia Municipality	Sofia Municipality is an administrative unit with the status of a region and is divided into 24 districts, administered by local mayors.	Data provider	Data contribution and system integration.
Organisations outside the local consortium	• Shared mobility operator 1 (BinBin), data owner • Shared mobility operator 2 (Lime), data owner		

Use Case 2 (tbc)	
Description	Connected Parking & Walking Journeys (Park&Walk)

The **overarching objective** is to address the growing traffic flows causing congestion and traffic jams as everyday occurrences in Sofia. Mobility data sharing, particularly through journey planners involving public transport and green shared mobility, aims to reduce traffic and enhance the overall living environment. This use case specifically focuses on connected green and shared mobility journeys. Sofia aims to deliver Mobility as a Service (MaaS) by implementing a multimodal solution that combines public transport with green on-demand mobility services. A new mobility app/service for journey planning will be developed, leveraging data sharing between Sofia Urban Mobility Centre (UMC) and shared mobility providers offering e-scooters, e-cars, e-bikes, etc. Buffer parking zones around metro stations will be considered to provide a service for both Sofia's citizens and those living outside but working in the city.

Currently, the **status quo** reveals UMC's data is utilised for public transport analysis and decision-making. The API Marketplace, initiated by UMC, already includes APIs for Park & Ride facilities and paid parking zones. Further development of additional APIs for local public transport (LPT) data sharing is planned, addressing existing challenges related to data silos and interoperability issues. To optimise the planning of LPT services additional mobility demand data is required, covering all means of movements in the city, like sharing mobility services (e.g., bikes, scooters, cars), ride services (e.g., taxis), non-motorised modes (e.g. walking and cycling) and others. For example, mobility patterns, such as home-to-work, home-to-school need to be known, which will help to implement an origin-destination matrix. A significant obstacle is that the traffic is measured by different authorities and the respective data remain in silos without sharing and standardisation. The traffic measurements are collected by different technologies over different infrastructures and protocols, hindering data re-use. Sofia aims to utilise the traffic measurements and find work-around solutions in case of missing data. Data from telecom operators can be used, for example, to monitor the spatial-temporal behaviour of people and to estimate the resulting traffic and emissions. Due to its rising population, Sofia is very crowded with considerable daily traffic congestion, which has led to increasing air pollution. By estimating the traffic and emissions, city authorities can make data-driven decisions for solving traffic problems.

Sofia's **motivation** for this use case is rooted in the city's history of traffic-related air pollution issues, consistently ranking among the most polluted cities in Europe. The main contributors to air pollution are traffic and domestic heating. Mobility data sharing, especially through journey planners involving public transport and green shared mobility, is seen as a crucial step to reduce traffic and improve the living environment. The use case will be marked **successful** if it can involve at least three operators of green shared mobility services, seeking to identify new business models and services based on shared data. Additionally, the city aims to engage other cities in Bulgaria.

However, potential **risks** for the use case include a lack of interest from shared mobility operators due to competitiveness or external limitations (e.g., headquarters), as well as challenges related to interoperability between municipality departments and mobility operators.

In addition to harmonised KPIs to compare progress across local implementation projects, the following preliminary **KPIs** have been defined for the implementation in Sofia:

KPI 2: Amount and types of data made available in machine-readable format

- 40+ datasets on public transport, parking and other (e.g, charging points and plug type, car sharing, bike sharing, existing and planned cycle routes, pedestrian network).

- 20+ datasets made accessible to external stakeholders through deployEMDS.
- 20+ data sets public transport.
- 10+ data sets parking.
- 5+ data sets car sharing.
- 5+ data sets bike sharing.
- 6+ data sets functioning stakeholders.

KPI 3: Adoption of the common technical infrastructure and governance. mechanisms by different types of participants

- 20+ registered stakeholders (e.g., PA, mobility companies, service/MaaS providers, consultancy companies) consuming data shared within the use case.
- 100+ data requests.
- 6+ functioning public and private stakeholders integrated into a functioning stakeholder ecosystem actively sharing data within the use case and project as a whole.

KPI 4: Services, products and processes developed or improved due to the use of the common European mobility data space

- 3+ new innovative services, including demand prediction models, MaaS integrating PT and shared micro-mobility, parking information (e.g., parking spaces in park&ride zones, payment for short-term parking zones).
- 5+ improved services (e.g., public transport real-time passenger information, journey planner, optimised timetables, MaaS (PT and e-scooters, bikes, car sharing integration), parking management).
- 20% new customers of services.

KPI 5: Net gains in environmental performance enabled by the common EMDS deployment project(s)

- 1+ environment related indicators.
- 2+ traffic related indicators.
- 4+ mobility related indicators.
- Improve monitoring for at least 4 of the 6 relevant SUMI (air pollutant emissions, access to mobility services, opportunity for active mobility, multimodal integration, satisfaction with public transport, commuting travel time).

7.8 Stockholm

Overall objective	The City of Stockholm has set ambitious environmental and accessibility goals. Examples of efforts to reach the goals are the introduction of zero emission zones and a reduction of car traffic by 30% by 2030. A high degree of digitisation and data sharing is required to implement and evaluate the effects of the implemented measures.

Use Case 1	
Description	Implementing and monitoring zero emission zones and reduction of car traffic.

Roles and responsibilities			
Name	Description	Role	Responsibility
RISE	RISE is a state-owned research institute.	Local coordinator, use case leader	Coordination of local consortium and use case. Deployment of data space components.
City of Stockholm	Public authority (municipality).	Data provider	Provider of environmental data and traffic related data.
Trafikverket	The Swedish Transport Administration is responsible for the long-term planning of the transport system for road, rail, maritime and air traffic and functions as NAP.	Implementation partner	Advise on scaling the solution nationally.
Organisations outside the local consortium	• Samtrafiken, for-profit company owned by PTAs, provider of public transport data • Trafikförvaltningen, Local/regional public transport authority (PTA), Implementation partner • Stockholm Region, data owner • Sensor data providers		

The City of Stockholm has set ambitious environmental and accessibility **objectives**, and this use case plays a pivotal role in achieving these goals by facilitating the implementation and monitoring of zero-emission zones and aiming for a 30% reduction in car traffic by 2030.

The Stockholm Mobility Data Space (SMDS) will serve as the central platform for sharing and visualising data, forming the foundation for data-driven decision-making. This use case encompasses activities such as harmonisation, standardisation, data sharing, and incorporating new data.

The **status quo** in Stockholm indicates that data is segregated in silos, highlighting the pressing need for improved data management. In Jan 2023, the city of Stockholm shared a total of 108 datasets related to mobility and environment, such as air quality, through its public data portal. Furthermore, the datasets related to public transport and environment are shared through other portals, some of which do not belong to City of Stockholm. Moreover, the datasets relevant to Stockholm´s mobility and environment are continuously increasing, resulting in a greater number of datasets than previously reported. However, the extent of adoption of governance models and standardisation of data formats vary greatly between these datasets. Moreover, none of these data sets are currently being provided through a data space.

The **motivation** behind this use case stems from the necessity for an evidence-based approach to policy follow-up and the desire to contribute to the innovation community. The use case is considered a **success** for Stockholm if relevant datasets (both existing as well as up to 8 new datasets) are shared through the Stockholm Mobility Data Space and the shared data contributed to an evidence-based analysis of the low emission zone and target reduction of car traffic in Stockholm. The KPIs further operationalise indicators of success. The choice of relevant datasets from the entire portfolio will be done based on their relevance to the objective of the local implementation project and the transversal use cases which will be defined later in the project.

However, there are identified **risks** within the scope of this use case. The relevant data involve vehicle number plates, which are considered personal data and hence are subject to GDPR regulations. Additionally, camera surveillance necessitates permits, and legal barriers may arise, potentially impeding the process. Another category of risks is related to collaboration of national actors and data owners who are not formally a part of the project. Delays in their cooperation may impede the progress. Moreover, in this use case, a considerable amount of data will be shared. There is no existing study which states the combination these shared data and open data can remain in the same security classification or requires a different classification. Finally, this use case inherits the risks identified in horizontal work packages.

Fortunately, none of the listed risks have materialised so far in the project. A mitigation policy adopted in the project is staying ahead of the time schedule to make time for contingencies against the identified and unidentified risks.

In addition to harmonised KPIs to compare progress across local implementation projects, the following preliminary **KPIs** have been defined for the implementation in Stockholm:

KPI 2: Amount and types of data made available in machine-readable format

- Daily, monthly and yearly amount of data in the city of Stockholm (50, 5 and 3 data points respectively).
- 43 datasets incl. static road data (daily), traffic regulation data (daily), public transport data, goods transport data, micromobility data (monthly), traffic count data, car sharing data (yearly), air quality and weather data (daily), noise data (twice daily), charging infrastructure data (yearly), statistics from public authorities (yearly).

KPI 3: Adoption of the common technical infrastructure and governance. mechanisms by different types of participants

- 2+ registered participants (data providers and consumers of the shared data).
- 10% increase in data requests per year.
- 1 additional city following deployEMDS implementations in Stockholm.
- 1 additional private company active in mobility and transportation who use SMDS/deployEMDS for sharing data.

KPI 4: Services, products and processes developed or improved due to the use of the common European mobility data space

- At least 1 new innovative service provided based on the data by external innovators.
- At least 5 data transactions streamlined and improved using SMDS/deployEMDS.

KPI 5: Net gains in environmental performance enabled by the common EMDS deployment project(s)

- Improve environmental monitoring related to annual reduction of car traffic in Stockholm City, reduction of mobility related emissions in Stockholm City and reduction of mobility related emissions in measurement points near the low emission zones.

7.9 Tampere

Overall objective	The main objective of the Tampere pilot is to make data sources, which are needed to fulfil the requirements of the updated ITS Directive 2010/40/EU and other directives, available to the NAP, as well as to improve the potential of the city to assess the impact of actions taken to reach the city targets related to optimisation of the transport system and emissions and to calculate SUMI indicators. A major objective is to set up an infrastructure, which allows to make data from other stakeholders, including data with restrictions on use, to be made available. APIs will be developed and deployed at the Finnish NAP regarding the conditions under which data from commercial providers can be used for e.g. traffic information and traffic management.

Use Case 1	
Description	Collection of data, mandated by ITS directive, and interface to NAP

Roles and responsibilities			
Name	**Description**	**Role**	**Responsibility**
VTT	VTT Technical Research Centre of Finland Ltd is the largest research organisation in Finland.	Local coordinator, use case leader	Coordination of local consortium. Deployment of data space components.
City of Tampere	The City of Tampere is responsible for traffic management in Tampere and the organisation of public transport.	Data provider	Provider of traffic data and environmental related data.
Fintraffic	Fintraffic is a 100% state-owned company that operates under the ownership steering of the Ministry of Transport and	Implementation partner	Data provision and aggregation. Deployment of data space components.

	Communications and acts as the NAP.		
Organisations outside the local consortium	• Tampere Regional Transport Nysse, local public transport authority, owned by City of Tampere and neighbouring municipalities, data provider. • Voi & other eScooter providers, eScooter provider, data provider.		

The vision for Finland is to provide travellers across the country with a continuous, real-time view of multimodal traffic, enabling them to access all necessary data from the mobility data space. This accessibility empowers users to enhance travel comfort, efficiency, and reduce emissions, with data available anytime, anywhere, and on any vehicle.

Tampere's use case aligns with this vision by collecting data mandated by the ITS directive and interfacing with NAP. The **objective** is to foster the availability of data, including commercial data, in an interoperable way, meeting EU directive requirements, and developing services to improve situational awareness. This, in turn, improves readiness to assess the impact of measures to achieve the SUMP targets.

The **status quo** is that a lot of information is already collected, but it is not always in the right format, only partially collected, or not of sufficient quality. For instance, static public transport data are available in General Transit Feed Specification (GTFS) format, but not in the Network Timetable Exchange (NeTEx) format, which is required by the MMTIS Directive. Data on public transport vehicle occupancy is available for trams and has been piloted for buses, but the quality is not always sufficient. Data from scooters and rental bikes are available for some providers but not for all, and different providers use different protocols (General Bikeshare Feed Specification, GBFS and NeTEx). Data on winter maintenance vehicles is collected in some city districts but not all. Traffic volume is measured using smart cameras in the city but has not yet been made available to the NAP. The **motivation** for the use case is grounded in the intention to comply with EU regulations, develop methods to exploit data, support measures to reach SUMP targets, and simplify and harmonise processes for negotiating, accessing, and using third-party data sources. The use case will be considered **successful** if the mandated data is available in a harmonised format in the NAP (data space compliant), is usable, and supports the calculation of SUMI indicators.

Risks include potential gaps in data collection, limited access by data owners, data not being in the correct format, low data quality, and essential data not being available. A major risk is also the lack of human resources among stakeholders responsible for data collection. To mitigate these risks, data collection priorities will be established, and the need for data collection will be closely monitored. Data collection and integration of the data will be planned together with the data owners to ensure that the data will be available during the course of the project.

In addition to harmonised KPIs to compare progress across local implementation projects, the following preliminary **KPIs** have been defined for the implementation in Tampere:

KPI 2: Amount and types of data made available in machine-readable format

- 40+ infrastructure devices providing real-time data at 10-minute intervals to the data space (baseline: 0).
- 10+ real-time data sets related to traffic in Tampere (baseline: 5).
- 10 data sets transferred from the City of Tampere to the Finnish NAP (baseline 5).
- 100 data sets in the NAP made available to the common EMDS.

KPI 3: Adoption of the common technical infrastructure and governance mechanisms by different types of participants

- 12,000,000 daily data requests (MMTIS).
- 20,000,000 daily data requests (RTTI).
- 2 additional data providers.
- 1 additional city following deployEMDS implementations in Tampere.

KPI 4: Services, products and processes developed or improved due to the use of the common European mobility data space

- 3 data sets with Improved data coverage (covering the main city area), compared to the status quo.
- 3 data sets fully complying to standards, compared to the status quo.

KPI 5: Net gains in environmental performance enabled by the common EMDS deployment project(s)

- Contribution to common prediction models on mode share and emissions.
- Improved environmental monitoring, including relevant SUMI (5 datasets, to be defined).

8 Conclusion

This inception report provides an overview of the deployEMDS project, outlining its scope, objectives, and implementation approach. In addition to elaborating on the project work packages, multifaceted stakeholder landscape and organisational set-up, the report presents the work plan and timeline including the main deliverables and milestones to be achieved. The consortium conducted a thorough risk assessment and defined mitigation strategies and continuous monitoring measures to foster effective and adaptive project implementation. The chapters on technical, legal and governance state-of-play describe the complex and dynamic environment in which deployEMDS is embedded. It is worth noting that data spaces in Europe are still emergent and that many questions regarding technical architecture choices, effective governance mechanisms, and long-term operating models will need to be addressed by the broader community over the coming years. The monitoring and evaluation framework is designed to ensure continuous learning and adaptation throughout the project lifecycle.

Making data findable, accessible and sharable in a controlled, simple and secure manner offers huge potential for value creation in the mobility domain. The deployEMDS project contributes to the further development of the common European mobility data space through the realisation of real-life local implementation projects in cities and regions across Europe. Each implementation site faces distinct challenges in its current mobility data landscape, requiring solutions tailored to local needs. At the same time, there are recurring themes related to interoperability, standardisation, inclusivity and effective data-driven decision-making that cut across use cases and geographies. A common thread among all stakeholders is the shared commitment to leveraging data to enhance mobility and contributing to the broader goal of creating smarter, more sustainable cities. deployEMDS strives to foster peer learning and engage stakeholders beyond the consortium to maximise spill-over effects, inspire innovative and improved mobility applications and support the long-term vision of achieving a digital and green transformation.

Annex 1: Partners

No.	Partner name	Partner short name	Role (main WP underlined)
1	Deutsche Akademie der Technikwissenschaften e.V.	acatech	Coordination (WP1, WP2, WP3, WP4, WP5)
2	Agenzia Trasporto Pubblico Locale del bacino della Città Metropolitana di Milano, Monza e Brianza, Lodi e Pavia	AgeTPL	Beneficiary (WP4, WP5)
3	Agenzia Mobilità, Ambiente e Territorio SRL	AMAT	Beneficiary (WP4, WP5)
4	Autoritat del Transport Metropolità	ATM	Beneficiary (WP4)
5	Budapesti Közlekedési Központ. Zártkörűen Működő Részvénytársaság	BKK	Beneficiary (WP4)
6	Cefriel - Società consortile a responsabilità limitata	CEFRIEL	Beneficiary (WP2, WP4, WP5)
7	EMEL - Empresa Municipal de Mobilidade e Estacionamento de Lisboa, E.M. S.A	EMEL	Beneficiary (WP4)
8	EMTA European Metropolitan Transport Authorities	EMTA	Beneficiary (WP2, WP3, WP4, WP5)
9	EnRoute	enRoute	Beneficiary (WP4)
10	EONA-X	EONA-X	Beneficiary (WP2, WP3, WP4)
11	European Road Transport Telematics Implementation Coordination Organisation - Intelligent Transport Systems & Services Europe	ERTICO	Beneficiary (WP4, WP5)
12	Fundació Eurecat	EURECAT	Beneficiary (WP2, WP4)
13	Factual Consulting SL	FACTUAL	Beneficiary (WP4, WP5)
14	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V.	FHG	Beneficiary (WP1, WP2, WP3, WP4, WP5)
15	Liikenteenohjausyhtio Fintraffic Oy	Fintraffic	Beneficiary (WP3, WP4)

16	FIWARE Foundation e.V.	FIWARE	Beneficiary (WP2)
17	FRCB B.V.	FRCB	Beneficiary (WP2, WP4)
17.1	FRCB IT Solutions B.V.	FairsFair	Beneficiary (WP3)
18	Fundació privada i2CAT, Internet i Innovacio Digital a Catalunya	i2CAT	Beneficiary (WP2, WP4, WP5)
19	Interuniversitair Micro-Electronica Centrum	IMEC	Beneficiary (WP2, WP4, WP5)
20	Instant System FR	INSTANT SYSTEM	Beneficiary (WP4, WP5)
21	IONOS SE	IONOS	Beneficiary (WP2, WP3, WP4, WP5)
22	Katholieke Universiteit Leuven	KU Leuven	Beneficiary (WP3, WP5)
23	Nommon Solutions and Technologies SL	NOMMON	Beneficiary (WP4)
24	NTT Data Spain, SI	NTTDATA	Beneficiary (WP2, WP3, WP4, WP5)
25	POLIS	POLIS	Beneficiary (WP3, WP4, WP5)
26	Rise Research Institutes of Sweden AB	RISE	Beneficiary (WP2, WP3, WP4, WP5)
27	Stockholms stad	STOCKHOLM	Beneficiary (WP4, WP5)
28	Tsentar za Gradska Mobilnost EAD	SUMC	Beneficiary (WP4)
29	Tampereen kaupunki	CITY OF TAMPERE	Beneficiary (WP4)
30	TML - Transportes Metropolitanos de Lisboa EMT, SA	TML	Beneficiary (WP4, WP5)
31	Trafikverket	TRV	Beneficiary (WP3, WP4)
32	Technische Universität Braunschweig	TU BRAUNSCHWEIG	Beneficiary (WP1, WP3)
33	the urban institute Magyarország Zártkörűen Működő Részvénytársaság	UIH	Beneficiary (WP2, WP4, WP5)

34	Sofia University „St. Kliment Ohridski”	UNISOFIA/GATE	Beneficiary (WP4, WP5)
35	Urban Software Institute GmbH	USI	Beneficiary (WP1, WP2, WP4, WP5)
36	Vianova	VIANOVA	Beneficiary (WP2, WP4)
37	Vlaamse Gewest	VLO	Beneficiary (WP4)
38	Teknologian tutkimuskeskus VTT Oy	VTT	Beneficiary (WP2, WP4, WP5)
39	Bundesanstalt für Straßenwesen	BAST	Associated Partner
40	EIT KIC Urban Mobility SI	EIT-UM	Associated Partner
41	Freie und Hansestadt Hamburg	FHH	Associated Partner
42	Mobility Data Space (DRM Datenraum Mobilität GmbH)	MDS	Associated Partner
43	Landeshauptstadt München	CITY OF MUNICH	Associated Partner
44	Stolichna Obshtina	SOFIA MUNICIP.	Associated Partner
45	Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek	TNO	Associated Partner

Annex 2: List of milestones and deliverables

The following table lists the milestones and deliverables in chronological order by submission date.

No.	Title	WP	Submission date
Milestone 1	Establish Advisory Board and Security Advisory Board (SAB)	WP1	22/12/2023
Milestone 15	Barcelona: Specification of roles and responsibilities	WP4	22/12/2023
Milestone 16	Budapest: Specification of roles and responsibilities	WP4	22/12/2023
Milestone 17	Flanders: Specification of roles and responsibilities	WP4	22/12/2023
Milestone 18	Île-de-France: Specification of roles and responsibilities	WP4	22/12/2023
Milestone 19	Lisbon: Specification of roles and responsibilities	WP4	22/12/2023
Milestone 20	Milan: Specification of roles and responsibilities	WP4	22/12/2023
Milestone 21	Sofia: Specification of roles and responsibilities	WP4	22/12/2023
Milestone 22	Stockholm: Specification of roles and responsibilities	WP4	22/12/2023
Milestone 23	Tampere: Specification of roles and responsibilities	WP4	22/12/2023
Milestone 2	Detailed project plan	WP1	31/01/2024
Milestone 24	Establishment of use case clusters	WP4	31/01/2024
Milestone 28	Website online	WP5	31/01/2024
Milestone 3	Define the project Security Policy	WP1	29/02/2024

D4.1	Inception report	WP4	29/02/2024
D5.1	Communication, dissemination, and exploitation plan	WP5	29/02/2024
D2.1	Technical requirements	WP2	29/03/2024
D2.2	Annex to Technical requirements	WP2	29/03/2024
Milestone 29	Network of follower cities established	WP5	30/04/2024
D4.2	Barcelona: Use case implementation plan	WP4	30/04/2024
D4.3	Budapest: Use case implementation plan	WP4	30/04/2024
D4.4	Flanders: Use case implementation plan	WP4	30/04/2024
D4.5	Île-de-France: Use case implementation plan	WP4	30/04/2024
D4.6	Lisbon: Use case implementation plan	WP4	30/04/2024
D4.7	Milan: Use case implementation plan	WP4	30/04/2024
D4.8	Sofia: Use case implementation plan	WP4	30/04/2024
D4.9	Stockholm: Use case implementation plan	WP4	30/04/2024
D4.10	Tampere: Use case implementation plan	WP4	30/04/2024
Milestone 30	ISG established	WP5	31/05/2024
D4.11	First assessment report	WP4	31/05/2024
Milestone 4	Biannual budget review I	WP1	28/06/2024
Milestone 31	Training platform online	WP5	31/07/2024

Milestone 26	Additional transversal use case frameworks	WP4	31/10/2024
D3.1	Report on existing regulatory frameworks and governance mechanisms	WP3	31/10/2024
D2.3	Technical specifications report	WP2	31/10/2024
D2.4	Annex to Technical specifications report	WP2	31/10/2024
Milestone 5	Biannual budget review II	WP1	23/12/2024
Milestone 9	Data space testbed available	WP2	28/02/2025
D4.12	Interim evaluation report	WP4	30/04/2025
Mile-stone 6	Biannual budget review III	WP1	30/06/2025
Milestone 12	Policy lab methodology available	WP3	31/07/2025
Milestone 13	Preliminary legal analysis available	WP3	31/07/2025
Milestone 10	Building blocks operational in testbed	WP2	31/10/2025
Milestone 14	Preliminary analysis on business, governance and incentive mechanisms available	WP3	31/10/2025
Milestone 32	2 project videos on learnings and results	WP5	31/10/2025
Milestone 7	Biannual budget review IV	WP1	23/12/2025
Milestone 25	SUMI transversal use case framework	WP4	31/12/2025
Milestone 11	Summary of policy lab conclusions available	WP3	29/05/2026
Mile-stone 8	Biannual budget review V	WP1	30/06/2026

Milestone 27	Project evaluation available	WP4	31/08/2026
D4.13	Barcelona: Final report	WP4	31/08/2026
D4.14	Budapest: Final report	WP4	31/08/2026
D4.15	Flanders: Final report	WP4	31/08/2026
D4.16	Île-de-France: Final report	WP4	31/08/2026
D4.17	Lisbon: Final report	WP4	31/08/2026
D4.18	Milan: Final report	WP4	31/08/2026
D4.19	Sofia: Final report	WP4	31/08/2026
D4.20	Stockholm: Final report	WP4	31/08/2026
D4.21	Tampere: Final report	WP4	31/08/2026
D5.2	Urban mobility data management practices and data spaces (follower cities)	WP5	30/09/2026
D5.3	Outcomes and learnings from ISG	WP5	30/09/2026
D2.5	Plan for continuous operations of the data space building blocks	WP2	30/09/2026
D2.6	Report on common data space technical infrastructure and components	WP2	30/09/2026
D2.7	Annex to report on common technical infrastructure	WP2	30/09/2026
D1.1	Report of activities of the Steering Committee	WP1	30/10/2026
D3.2	Report on legal tools for compliance and interoperability in the mobility data spaces	WP3	30/10/2026

D3.3	Annex to the Report on legal tools for compliance and interoperability in the mobility data spaces	WP3	30/10/2026
D3.4	Report on multi-level governance framework with business and governance mechanisms	WP3	30/10/2026
D5.4	Project's final report	WP5	30/10/2026
D4.22	Overview report on lessons learned from use cases	WP4	30/10/2026
D4.23	Annex to the overview report on lessons learned from use cases	WP4	30/10/2026