DATA MANAGEMENT PLAN AND ETHICS

First version D1.2

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LIST OF ABBREVIATIONS AND ACRONYMS

Acronym	Meaning
AES	Advanced Encryption Standard
AI	Artificial intelligence
AIS	Automatic Identification System
ANPR	Automatic Number Plate Recognition
API	Application Programming Interface
CA	Consortium Agreement
CCAM	Connected, Cooperative and Automated Mobility
CERN	European Organization for Nuclear Research
C-ITS	Cooperative Intelligent Transport Systems
CKAN	Comprehensive Knowledge Archive Network
CNIL	National Commission on Informatics and Liberty (Commission Nationale de l'Informatique et des Libertés)
CSW	Catalogue Service for the Web
DCAT	Data Catalog Vocabulary
DMP	Data Management Plan
DNSH	Do No Significant Harm
DOI	Digital Object Identifier
DoS	Denial-of-Service
DPIA	Data Protection Impact Assessment
DPO	Data Protection Officer
EMDS	European Mobility Data Space
ER	Expected Results
ERA	European Research Area
FADP	Federal Act on Data Protection
FAIR	Findable, Accessible, Interoperable and Reusable
FCD	Floating Car Data
GB	Gigabyte
GBFS	General Bikeshare Feed Specification
GDPR	General Data Protection Regulation
GeoJSON	Geographical features based on JSON
GEP	Gender Equality Plan
GIS	Geographical Information System
GNSS	Global Navigation Satellite System
GTFS	General Transit Feed Specification
HTTPS	Hypertext Transfer Protocol Secure
IPR	Intellectual Property Rights
IPsec	Internet Protocol Security
ITS	Intelligent Transport Systems
JSON	JavaScript Object Notation
KPI	Key Performance Indicator
LIDAR	Laser Imaging Detection and Ranging
Mb	Megabytes
MTM	Multimodal Traffic Management
NAP	National Access Point
NAPCORE	National Access Point Coordination Organisation for Europe
NeTEx	Network Timetable Exchange
OSM	Open Street Map

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PIS	Participant Information Sheet
PU	Public
RBAC	Role-Based Access Control
RDF	Resource Description Framework
RIS	River Information Services
RSU	RoadSide Units
SIRI	Service Interface for Real-time Information
SotA	State of the Art
SPARQL	SPARQL Protocol and RDF Query Language
STEM	Science, Technology, Engineering, and Mathematics
SUMO	Simulation of Urban Mobility
TB	Terabytes
TLS	Transport Layer Security
TN-ITS	Transport Network Intelligent Transport Systems
UML	Unified Modeling Language
UK DPA	United Kingdom Data Protection Act
V	Version
W3C	World Wide Web Consortium

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DELIVERABLE EXECUTIVE SUMMARY

This report is the first deliverable of Task 1.4 “Responsible innovation: ethics, open access and data management” and it describes the Data Management Plan (DMP) for the project FEDORA, funded by the Horizon Europe initiative aimed at revolutionising traffic and network management by using a federated data space platform, simulations and a service space. This document outlines the project’s development of a Data Management Plan and ethical framework, ensuring alignment with the Grant Agreement and Consortium Agreement.

Key components of this deliverable include:

- Data Management Plan: how data is collected, stored, accessed, exchanged and approved for publication.
- Safety and security of data: how data will be stored, accessed and secured.
- Ethical aspects: measures, guidelines, and actions to ensure appropriate management of data, as well as equality in the daily activities of the project.

A DMP survey was created, and guidelines for the implementation of measures for data safety, security and ethics have been presented.

The purpose of the deliverable is to provide the main elements of the data management plan of FEDORA.

The goals of task 1.4 are to provide a complete overview of data categories that will be involved in the project (this first version of the DMP identifies an initial set of data categories that will be completed as the work of the project progresses), guarantee consent and privacy in the data collection, prioritise gender equality and prevent mobility inequalities in the project outcomes and ensure ethical compliance.

The DMP will be continuously updated and gain in precision throughout the project (updated versions will be submitted in M18 and M36).

Social Media link:

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1 INTRODUCTION

This deliverable work is part of the "Project management" Work Package (WP) 1 and Task (T) 1.4 "Responsible innovation: ethics, open access and data management". This document is the first version of the data management plan of FEDORA. It focuses on the development of FEDORA's Data Management Plan and an ethical management process framework.

Its purpose is to present an overview of the main elements of the data management recommendations and measures that are going to be used by the consortium of FEDORA, regarding all the data that will be generated, harvested and/or used by the project.

A key objective of deliverable D1.2 is to identify an initial set of data categories that will be involved in the project. This document also has the goal to guarantee consent and privacy in the data collection, prioritise gender equality and prevent mobility inequalities in the project outcomes and ensure ethical compliance (including Artificial intelligence (AI) ethics).

The DMP has the following characteristics:

- It covers the entire project life cycle, including how the information collected during the project will be preserved.
- It is a living document; it evolves and gains more precision and substance during the lifespan of the project therefore updated versions will be submitted in M18 and M36.

This document is primarily intended to serve as an internal guideline and reference for all the partners of the consortium, reference group and advisory board members. This deliverable is also of high interest to anyone willing to understand the data management procedures followed during the project as part of the process of reusing the published datasets.

The dissemination level deliverable D1.2 is public (PU), and it is available to the members of the consortium, the European Commission (EC) services and those external to the project.

1.1 PROJECT OVERVIEW

Lack of orchestration structured and standardized integration protocols and metadata descriptors, incorporation of real-world traffic complexities and nuances, underutilization of valuable resources, model uncertainties and integration of micro-mobility services and vulnerable road users result in suboptimal performance in addressing complex issues related to the management of mobility services and infrastructure and a divergence from European Union's sustainable mobility targets. FEDORA aims to pave the way towards advanced traffic and network management through the development of a federated spaces platform offering a holistic framework of innovative solutions and services that enable precise and proactive sensing of supply and demand, facilitate optimal operation of transport services and advance learning and evolution in complex environments.

At the operational level, FEDORA offers a collaborative space of data that can realize advanced data alchemy processes using interconnected services and tools, a space of advanced traffic management optimisation services and a multi-modal simulation space to create and assess future mobility scenarios. The approach is validated in six thematic demonstrations in Vienna (Austria), the Basque country (Spain), Reggio Emilia (Italy), Nicosia (Cyprus), Budapest (Hungary) and Greater Copenhagen (Denmark), covering varying European Union (EU) urban and rural contexts, infrastructure maturity levels, multimodal mobility services availability, organisation/operational structures and social conditions. Interaction with existing programmes on road mapping and recommendations at national, EU and global level will be promoted, allowing a multiplication effect of project's results.

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The FEDORA consortium comprises 16 partners from 11 countries, including two associated partners. The project spans 36 months and is divided up into seven Work Packages, each contributing to the development, integration, and demonstration of innovative multimodal mobility solutions.

This deliverable aligns particularly with the goal of the project to address technological barriers and challenges of data-sharing by addressing to the lack of standardisation, metadata descriptors, available transport data in a single place, system architecture, service interoperability and continuity by providing an example of how it can be done differently by following the Findable, Accessible, Interoperable and Reusable (FAIR) principles, open data and secure practices. FEDORA will ensure that all the project's task are interoperable with a proven track record and proved interoperability in the selected pilot sites. The proposed safe and secure mobility data space addresses issues of data interoperability, harmonisation, governance, sovereignty and trust. The objectives of the task associated with this delivery directly target some of the mentioned barriers by offering an innovative ecosystem which encourages the sharing of ideas and knowledge. This delivery will cover as well ethical and data security subjects, for instance; guidelines for handling personal data carefully will be provided to ensure consent before collecting any personal data. Information will be given, and an acknowledgement of data collection will be required. Additionally, this deliverable(D) will provide information about gender equality measures that will be taken, as FEDORA has the objective to align with the European Research Arena (ERA[1]) and the Gendered innovations 2[2] analysis. These last recommendations, for integrating sex and gender analysis, will be explored to develop a Gender Equity Plan (GEP) that applies equity, in open science and into research and innovation (R & I), throughout the project and acknowledges the importance of addressing gender issues.

The objectives of Task 1.4 are:

i) Data security, confidentiality, sharing, and Open Access compliance;
ii) Responsible Research Innovation;
iii) Gender Equality: monitoring of potential findings and measures for ensuring integration and equity in attending women needs, and perspective of men and women will be reported;
iv) Implementing FAIR data management principles;
v) Appointing a Data Protection Officer (DPO);
vi) Establishing a data management plan; and
vii) Ensuring ethical compliance, including AI ethics, through guidelines and compliance matrix.

The data management follows good practices guidelines and tracks the data-related activity of the partners to propose recommendations to make sure that all the partners adhere to national and EU laws, General Data Protection Regulation (GDPR) practices, and ensure complete security and accountability.

1.2 MAPPING FEDORA OUTPUTS

This deliverable serves as an entry point to understand the project-wide approach to data management. Therefore, it is a relevant reference to the management of all tasks and work packages, although it is more strongly connected with tasks generating, collecting and processing data.

All the deliverables related to this task are associated with a milestone of the project. In Table 1, below, you will find the concerned milestones:

[1] https://european-research-area.ec.europa.eu/era-actions-2025-2027
[2] https://op.europa.eu/en/publication-detail/-/publication/33b4c99f-2e66-11eb-b27b-01aa75ed71a1/language-en

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No.	Deliverable and short description	WP	Lead	T.	Due	Means of verification
MS1	IGNITE– Best practices and State-of-the-Art (SotA) update, dissemination plans and project management handbook available.	1	AKKIS	R.	6	D1.2
MS3	SPARK – First versions of FEDORA Data, Service and Simulation space available. Version 1 of integrated platform available. Decision making mental models and network management governance schemes available. Demonstration plan established, dissemination activities and project monitoring reports available.				18	D1.4
MS6	FIREWORK – Demonstrations completed and assessed. Business exploitation activities completed. Scale up and multiplication activities completed. Standardization reports available and dissemination activities monitoring report available.				36	D1.6

Table 1: Milestones associated with T1.4 and the DMP

Deliverable 1.1 of WP1 is closely related to this task as it establishes a base on the implementation strategy, management plan and the quality & risk management of the project.

The deliverables of WP3 on "Cross-sectoral Data Space for Multimodal Mobility" are closely related with this task as its tasks will help to develop a collaborative space of data that can facilitate advanced data alchemy processes using interconnected services and tools that can offer:

- Standardised interfaces for cross-sectoral co-operation and exchange of heterogeneous data;
- A universal data catalogue with harvesting functionality for automated data extraction;
- Semantic enrichment and data fusion mechanisms;
- Mechanisms for the characterisation of application domains and usefulness and validity metrics for datasets;
- Dynamic smart contracts to allow adaptable, transparent and trustworthy data sharing;
- Big-Data enabling solutions.

The deliverables of WP7 on "Dissemination, scale-up, standardization and exploitation" will provide indications on how data will be disseminated and exploited during and after the project:

Together, these deliverables ensure that all consortium partners are aware on how the project will manage data, quality, sharing, enrichment, harmonization, security, results and dissemination.

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1.3 STRUCTURE

Deliverable D1.2 is structured as follows:

Chapter 1 – is an introduction to the project and the deliverable.

Chapter 2 – is an overview of the data managed, the implementation of the FAIR principles, the allocation of resources and the data referents and managers.

Chapter 3 – will provide information on data safety and security.

Chapter 4 – covers subjects related to ethical aspects: General Data Protection Regulation, Intellectual Property Rights, personal data, gender equality and Artificial Intelligence ethics.

Chapter 5 – is the conclusion of the deliverable.

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2 DATA MANAGEMENT

Data exchange and discovery are at the heart of FEDORA. This project aims to improve data orchestration through structured and standardised integration protocols and metadata descriptors, which will compose a collaborative data space. This space will connect data to services and tools, enabling the analysis of data to create advanced traffic management optimisation services and a multimodal simulation space for creating and assessing future mobility scenarios, as well as models to improve policy making.

The data management plan of FEDORA will cover key aspects of how the data collected, developed, processed, generated and reused will be handled throughout the project. This will be done at first by answering the questions provided as guidelines in the HORIZON EUROPE Data-Management Plan Template [3] and following the recommendations of DMPONLINE[4]. In a second phase, the key aspects will be discussed by covering subjects related to proper data management within the scope of this project such as the metadata catalogue and open data vs non open data. Horizon Europe is a funding programme for research and innovation. FEDORA is funded by this programme and its objective is "to increase the effectiveness of funding by pursuing clearly defined targets" in its missions (European Commission, 2025). The beneficiaries of Horizon Europe are encouraged to follow these guidelines to manage the digital research data generated dutifully to ensure a proper follow-up and organisation of research projects (Brenel et al., 2023). These guidelines allow researchers to align with the FAIR principles since they are specified and associated with questions. Data management plans from other projects were also consulted for reference, particularly those on the Multimodal Traffic Management Cluster[5]. While not every single dataset can be addressed in this document, a global overview of the data handled is provided.

To have a complete overview of the practices, uses, formats and data categories used by the consortium partners, a survey was created as an online form and sent to the consortium members. The answers to this survey were processed and have been integrated into this document, particularly in chapter 2, as they are directly linked to the FAIR principles. This survey was composed of three main sections: data summary (formats, data usage, data size, sensitivity and re-use), FAIR data and RGPD & Ethics. The focus was given to the type, the purpose and the intended use of the data that is going to be collected, processed, and reused. The origin and provenance of the data, either generated or reused, were also asked, as well as its sensibility, findability, accessibility, interoperability and re-usability. We obtained 12 answers. More information about its content can be found in Annex I - Data Management Survey.

This survey as the DMP will be adapted and updated continuously during the project as new insights regarding data collection and processing arrive, but also as the work packages progress. The Data Management Plan belongs to T1.4 and Akkodis will lead this task, maintain the DMP (in accordance with the Grant Agreement of FEDORA) and act as the Data Protection Officer.

Since this project requires the collection of various types of data, according to the needs and specifications of the work packages and pilots, the first part of the data management plan will be dedicated to a general summary of the data that is or might be used and to the purpose of its collection. This first part will also present information about the main data types, formats, size and categories of data created or reused (2.1). In the second part of this chapter, the implementation of the FAIR principle will be covered (2.2). In the third part, the allocation of resources will be discussed (2.3), and in the fourth part, information regarding data providers, managers, and users will be given (2.4).

[3] https://www.openaire.eu/images/Guides/HORIZON_EUROPE_Data-Management-Plan-Template.pdf
[4] https://dmponline.dcc.ac.uk/plans
[5] https://www.frontier-project.eu/mtm-cluster

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2.1 DATA SUMMARY

This section provides the data summary handled within FEDORA. This project's data focus on traffic management, although this data will interconnect with data from other fields. Most of the data collected throughout the project is intended for research and development work.

2.1.1 PURPOSE OF DATA COLLECTION

The objective of the data collection is to develop and assess new mobility solutions, to integrate and organise data from diverse sources, to propose documentation, tools and a methodology to ease data sharing for future users, and to overall participate in the establishment of a data-sharing culture in Europe. The data collection also aims to extract meaningful patterns and knowledge.

The project will generate and use various computational frameworks, simulation engines (e.g. agent-based, traffic flow models), and predictive models for urban mobility forecasting. These models will simulate multi-modal transport scenarios and produce synthetic data to support evaluation and policymaking. Data will be collected to gather information about the pilot sites and traffic conditions.

Data will be gathered as well to develop different user information services; for instance, customisable and dynamic dashboards with views for handling spatiotemporal visualisation; a mobile app, with customisable interfaces to cover the needs of all various user groups; a multi-journey planner that integrates multiple modes and services through a single interface (based on models and simulations). These services depend on data collection inputs to be tested.

To better understand the purpose of the data collection, it is essential to know the objectives and the related Expected Results (ER) of FEDORA, as they shape the data requirements. These can be found below (for more details, please refer to section 2 of the project proposal):

- **Objective 1:** To establish a **federated group of spaces** for the cohesive design, implementation, and assessment of next-generation multimodal traffic management systems, by **integrating network optimization services, simulation insights, and data alchemy** within an organically **governed ecosystem** of public and private stakeholders, enabling **the dynamic quantification of Key Performance Indicators** (KPIs) for **evidence-based policy making**. (Implemented in WP2 "Definition, Integration and Governance of MTM Spaces")
    - ER1.1: Network management measures evaluation and deployment road mapping approaches
    - ER1.2: Dynamic governance models
    - ER1.3: FEDORA integrated platform
- **Objective 2:** To develop a **collaborative space of data** that can facilitate **advanced data alchemy processes** using interconnected services and tools that can offer (a) standardised interfaces for **cross-sectoral co-operation and exchange** of heterogeneous data; (b) a universal data catalogue with harvesting functionality for automated data extraction; (c) mechanisms for the characterisation of application domains and usefulness and validity metrics for datasets; and (d) **dynamic smart contracts** to allow **adaptable, transparent** and **trustworthy** data sharing. (Implemented in WP3 "Cross-sectoral Data Space for Multimodal Mobility").
    - ER2.1: Cross-sectoral traffic management data catalogue
    - ER2.2: Data extension, augmentation and characterisation tools
    - ER2.3: Big data enabled data space
- **Objective 3:** To realise a space of **advanced traffic management optimisation services** offering (a) **evolutionary usage patterns**, bottlenecks, and **anomalies detection**; (b) **dynamic and responsive planning of mitigation** measures; and (c) **propagation and resolution validation** of mitigation plans; all integrated in a commonly accepted concept of operations

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that complements existing network management practices. (Implemented in WP4 “Next Generation Multimodal Network Management Services Space”)
    - ER3.1: Social optimum, dynamic pricing and incentivisation models
    - ER3.2: Complex event processing and traffic response planning tools
    - ER3.3: Optimisation models for infrastructure systems, mobility services fleets, and user travelling
- **Objective 4:** To realise a **multi-modal simulation space** to enhance the optimization and decision-making capabilities of the *services space* solutions, as well as to create and assess future mobility scenarios through (a) accurate **demand representation** modelling, (b) passenger and freight controllers for **emulating emerging mobility services**, (c) **model-to-application** transferability framework, (d) smooth generation of simulation workflows and scenarios for **foresight analysis** based on clearly defined criteria. (Implemented in WP5 “Evolutionary Simulation Space for Network Wide Foresight Analysis”)
    - ER4.1: Integrated and interoperable simulation framework
    - ER4.2: Demand synthesisation and supply controllers for network-wide simulation
    - ER4.3: Foresight analysis with model-to application transferability frameworks
- **Objective 5:** To deploy and validate the effectiveness of the *FEDORA* solutions in 6 representative cities and areas, covering varying EU **urban and rural contexts, infrastructure systems maturity, availability of multimodal mobility services, organisation and operational structures** and **social conditions**, through the analysis of qualitative and quantitative results. (Implemented in WP6 “Demonstration of FEDORA Solutions”)
- **Objective 6: To accelerate the large take-up of FEDORA’ innovations through continuous impact creation activities that assure the exploitation and standardisation of the proposed solutions, and provide policy recommendations documenting the lessons learnt**. (Implemented in WP7 “Dissemination, scale-up, standardization and exploitation”)
    - ER5.1: FEDORA innovations’ evidence- based assessment
    - ER6.1: Policy adaptation, standardisation and impact multiplication instruments

While the exact purpose regarding the data collection, generation and re-use might differ, according to WP, task and pilot, some answers that arose from the surveys regarding the purpose of data collection were: “Traffic analysis and simulation performance” and “Evaluation and Policy Making to Enable Data Sharing”. Overall, the data generated and/or reused will help develop, calibrate, and document algorithms and tools that will facilitate the optimisation of multi-modal transport systems. Data will be almost exclusively for research work in the form of algorithm and software development, and documentation of developed tools.

2.1.2 DATA CATEGORIES

The categories, types and formats of data that are or will be handled, generated, processed or analysed during the project are very varied. In this section, we provide an overview, and a dedicated table with details will be available in section 2.1.5 (Table 7: Inventory of data categories and formats of data generated). The general data formats are administrative data and communication material, open research data, evaluation data, and technical and desk research data (see Table 2). The most frequent types of data that will be handled are algorithms, delivery reports, metadata, models, observations, platform/service/tool, processed data, publications/communication material, raw or structured data, results, scientific outputs, simulation data, software data, strategy data, general documentation and training material.

To have a better overview of the research data that will be collected, generated, and processed throughout the project, four major data categories were defined and are presented below.

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Category	Short description
ADMINISTRATIVE DATA AND COMMUNICATION MATERIAL	This category refers to the data generated/shared internally for administrative and management activities for historical purposes and follow-ups within WP1 & WP7 such as meeting minutes, recordings, internal reports and others.
TECHINICAL AND DESK RESEARCH DATA	This category includes data related to the technical developments of different WPs, particularly public and private traffic, simulation, model, geospatial, sensor datasets, as well as data related to the architecture of the data space.
EVALUATION DATA	The evaluation data concerns the data used to assess quantitatively methodology, impact and technical tools.
OPEN RESEARCH DATA	This category contains the data and results that will be published to comply with the project's ambition to remove industrial barriers of data-sharing.

Table 2: Data category short description

The open research data is a subset of the evaluation data which is itself a subset of the technical data.

The project plans to produce 29 deliverables to ensure all activities and technical progress are comprehensively tracked. For more information, please see D1.1 section 2.4.

2.1.2.1 ADMINISTRATIVE DATA AND COMMUNICATION MATERIAL

This category refers to the data produced by the project management activities for historical purposes and follow-ups within project management and dissemination, such as meeting minutes, recordings, and internal reports. It comprises data from project partners, but also information about technical & innovation management. This data will mostly be collected in WP1 "Project Management" and in WP7 "Dissemination, scale-up, standardisation and exploitation", but it requires contributions from all the WPs. Most of this data is internal, and some of the deliverables are Sensitive (SEN), which means that they are limited under the conditions of the Grant Agreement.

- Data management:
  - **D1.1** - Project Handbook, Quality Plan & Risk Management (T1.1-T1.3): SEN
- Data exploitation and recommendations:
  - **D6.1** - Demonstrations Planning Guidelines (T6.1): SEN
  - **D7.2** - IPR and innovation management, Exploitation Roadmap (T7.4)**:** SEN
  - **D7.3** - Recommendations for Policy Makers at EU, National and Local Levels (T7.3): SEN
  - **D7.4** - Standardization and Deployment Guidelines for Road Authorities and Industry: PU
- Project activities communication:
  - Six newsletters will be published during the project
  - **D7.1** - Dissemination /Communication Strategy & Kit: PU
- Activities concerning project stakeholders

2.1.2.2 TECHNICAL AND DESK RESEARCH DATA

The technical data category encompasses catalogue metadata, harmonised datasets, enriched datasets, as well as blockchain-based sharing agreements related to the technical developments of FEDORA, which primarily correspond to the contents of WP2, WP3, WP4, WP5 and WP6. For instance: traffic, simulation, model, geospatial or sensor datasets, as well as data related to the architecture of the data space.

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Here are some of the major sub-categories of the technical data that will be processed within FEDORA:

2.1.2.2.1 SECTOR DATA

2.1.2.2.1.1 Transport, mobility and traffic data

This category involves data collected from transport organisations, which share their timetables, schedules, infrastructure, network graph, services, aerial transportation data (i.e., for passengers and freight, including logistics), vehicle emission profiling data, travel time, dynamic road pricing and offers. It also involves data that provides traffic information, such as origin-destination flows, traffic (static and real-time data) counts and sensors, Automatic Identification System (AIS) data, Global Navigation Satellite System (GNSS) locations of vehicles and goods, Cooperative Intelligent Transport Systems (C-ITS), traffic light status, traffic light signal control algorithms and statistics data. This type of data will be collected from private and public road operators, private companies, governmental databases, stakeholders, or developed within the project based on statistics, models and previous results. It will mainly be gathered in WP3 and the pilots of WP6.

2.1.2.2.1.2 Environmental data

Real-time environmental data from external sources, such as hydrological information, weather warnings, conditions, and cameras, might be required during the project for traffic analysis.

2.1.2.2.2 TECHNICAL SUB-DOMAINS

2.1.2.2.2.1 Model data

Model data will be derived from external sources (for instance, national and regional transportation/traffic models), and some will be generated or built within the project based on statistics, project datasets or results from other models (like RoadSide Units (RSU) simulation models, unmanned aerial vehicle paths, ship motion, and online traffic model for road transport). This data helps in improving simulation, methods and training materials. This data will also help in integrating traffic management across all modes of transport for passenger and freight (including emerging mobility services), but it will also help to formulate policy recommendations to advance optimised Multimodal Traffic Management (MTM) in both urban and rural contexts and encourage data sharing. This data will be collected within WP2, WP3, WP4, WP5 and WP6.

2.1.2.2.2.2 Simulation data

Simulation data will be collected for the simulation of traffic and road transport to provide a near-real-time traffic situation, but also to assess the impact of dynamic pricing. This requires multimodal traffic models and interface port-motorways data, information on dynamic pricing artificial currencies, estimated time of arrival of ships, etc.). The data will be tested on existing open-source simulation platforms such as SimMobility[6] or on the SUMO[7] simulation environment. This data will be gathered for the pilots of WP5 and WP6.

2.1.2.2.2.3 Geospatial data

This category includes vector, raster, AIS, GNSS (.lat / .lon), OpenStreetMap (OSM) data or data models defined by the INSPIRE directive data. This type of data requires accurate location and can be shared through common geographical standards. This data will be collected mostly within WP6.

[6] https://mfc.mit.edu/simmobility/
[7] https://sumo.dlr.de/docs/index.html

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2.1.2.3 EVALUATION DATA

This category refers to the data collected for assessing methodology, impact and technical tools. This type of data will often come from quantitative surveys or interviews, but also from quality registered documents (such as the deliverable register and quality metrics register), refer to chapter 5.12 and Annex III of D1.1 for more details. Most of this data will be gathered as part of WP6 as it must align with the project goals by developing an evaluation framework to measure the pilot's impact. The assessment of the pilot demonstrations and the development of methodologies for KPIs quantification for the integration into standardisation or evidence-based risk assessment frameworks are part of Axis 5 "Solutions Integration, Augmentation and Impact Assessment" of the project. For more information, please refer to section 1.2.1 and 1.2.1.4 of the PROPOSAL_101203465-FEDORA-HORIZON-CL5-2024-D6-01.

- Evaluation
  - **D2.2** - Living Labs Setup, Spaces Definition, and Evaluation Models: PU
  - **D6.2** - Evaluation of the first round of demonstrations (T6.2 – T6.7): PU
  - **D6.3** - Solutions impact assessment: PU
- Surveys and interviews
- Pilots
  - **Pilot 1:** Multimodal model services optimisation for equitable future mobility, Vienna
  - **Pilot 2:** Seamless integration of logistics hubs for optimal door-to-door freight transport, Basque Country
  - **Pilot 3:** Integration of traffic management of aerial and road services, Nicosia
  - **Pilot 4:** Foresight analysis using network-wide simulations of realistic multimodal services, Denmark
  - **Pilot 5:** Managing demand using incentivisation, nudging and artificial currencies, Reggio Emilia
  - **Pilot 6:** Traffic Flow Simulation in inland waterways, Budapest

2.1.2.4 OPEN RESEARCH DATA

The open research data category refers to the data made available to the research community to encourage progress, by the dissemination of scientific results and knowledge accessibility through deliverables and demonstrations. Within FEDORA, these data will be focused on the development of a Cross-Sectoral Data Space and on six pilot areas which are used to evaluate the effectiveness of the solutions related to the EU wide Multimodal Traffic Management. The project partners envision publishing and harvesting harmonised documentation, datasets and metadata by following specifications and standards (for instance: mobilityDCAT-AP, INSPIRE) on Zenodo, OpenAIRE and a CKAN-based catalogue. Data will be enhanced by AI-supported metadata comprehension as well as synthesis and augmentation tools. Produced results within FEDORA and demonstrations will be available for research purposes to all partners, after being subjected to appropriate anonymisation and securitisation measures. Open datasets will be publicly accessible unless restricted due to Intellectual Property Rights (IPR), security, or GDPR constraints.

- State-of-the-art:
  - **D2.1** - Best practices & state-of-the-art: Updated review of SOTA in FEDORA scientific areas, and MTM best practices knowledge base: PU
- Demonstrations:
  - **D2.3** - FEDORA platform and Network Management Governance v1: PU
  - **D2.4** - Integrated FEDORA platform and Network Management Governance v1: PU
  - **D3.1** - Integrated Cross-Sectoral Data Space: PU
  - **D3.2** - AI-Enhanced Data Utilization and Smart Contracting: PU
  - **D3.3** - Integrated Data Space: PU
  - **D4.1** - Optimization and Incentivization Models for Multimodal Networks: PU
  - **D4.2** - Advanced Routing & Mitigation Strategies: PU

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- **D4.3** - Integrated MTM Services Space: PU
- **D5.1** - Integrated Multimodal Simulation and Prediction Framework: PU
- **D5.2** - Modular Simulation Platform and Sim2Real Techniques: PU
- **D5.3** - Integrated Simulation Platform: PU

As a general resume of section 2.1.2, table 3 provides information about the main general known and identified data sources, types, formats and sizes by WP.

WP	Sources description	Data Type	Format	~SIZe
WP1	Requirements engineering (surveys, interviews, Unified Modeling Language (UML))	Administrative data	Excel, CSV, UML	GBs
WP 2, 3, 4, 5	Open Data Sources	Technical data / Open research data	Relational, XML, JSON	GBs
	Specifications and principles aligned with the European Mobility Data Space (EMDS); data use depends on the availability and access conditions.	Open research data / Technical data		
	ERTICO's Transport Network - Intelligent Transport Systems (TN-ITS) 10	Technical data	Relational, XML, JSON	GBs
	Data Sources provided or to be updated for FEDORA (by consortium partners)	Technical data / Open research data		
	FEDORA EU cities road surface and infrastructure data	Technical data	Heterogenous data	GBs
	Laser Imaging Detection and Ranging (LIDAR), cameras and drones video stream	Technical data	Heterogenous data (including sensor, video)	TBs
	RoadSide Units (RSU) data, connected vehicles data, road user behavioural data, data from sensors installed in road infrastructure, traffic accidents data base, on board unit-based vehicle sensing data in pilot locations	Technical data	Relational, XML, JSON	
	Use case -specific quantitative survey data, impact assessment surveys	Evaluation data	Heterogenous data	MBs
WP4, 5	Awareness and dissemination data, impact assessment surveys	Evaluation data	Heterogenous data	GBs
	S&T outputs, business models, papers, back/side/foreground	Open research data	Documents	GBs
WP6	Transport, mobility, traffic data, simulation, model, geospatial, environmental and/or sensor datasets and pilot metrics.	Technical data Evaluation data	Heterogenous data	GBs
WP7	Dissemination, tracing documents, KPIs, and publications	Administrative data and communication material	Excel, CSV	MBs

Table 3: Data sources description, type, format and expected size by work package.

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2.1.3 DATA COLLECTION

FEDORA will develop a catalogue for searching, accessing and fusing multimodal mobility data in the data space. This platform will provide effective tools to facilitate access to and exchange of mobility data (by humans and machines) for mobility actors, data innovators and overall users.

To develop the catalogue, an inventory of datasets and sources has been created with both open data and non-open data. This spreadsheet file provides details about the available organisations' data portals, the geographical area covered by the dataset and other criteria, including provider, description, theme, keywords, distribution, licenses, access policy, etc. Non-open datasets will require data-sharing agreements and may be subject to smart contracts (for more information please refer to WP3, T3.5).

2.1.3.1 INVENTORY OF DATA SOURCES

An inventory of data sources has been created to track the main information about the most relevant data portals and get an idea of the type of datasets that can be found in their data portals or websites. Part of this information will be necessary for the creation of the harvesting sources for the CKAN catalogue. The data catalogue will allow the discovery of multimodal mobility and geospatial data types.

In the Table 4, below, there are three examples of the main information which is collected and that will be available on the CKAN data catalogue. This list will be updated and extended as work on the project progresses, but it will be only accessible as registered or harvested on CKAN:

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IDENTIFIER (URI)	NAME SOURCE	DATA SOURCE DESCRIPTION	SPATIAL COUVERAGE	TYPE	STANDARD/ SPECIFICATION	FORMAT	ACCESSIBILITY (OPEN ACCESS Y/N)	DATA SOURCE URL	LICENSE	LANGUAGE
aa051cf6-d31b-41a0-a256-3d1af4248446	Open Data Bizkaia	Open Data Bizkaia. Access, reuse and share the open data of public institutions in Bizkaia	Basque Country, Spain	Real time/ Historical	RDF	ATOM, CSV, JSON, KML, TSV, WFS, WMS, WMT, XLSX, XML, ZIP	Y	https://www.opendatabizkaia.eus/es/catalogo/	CC BY 4.0 (http://creativecommons.org/licenses/by/4.0/rdf")	ES/EU/EN
55ab5883-9156-45f2-b656-959d8c2fc1f1	NAP Austria - MobilityData AustriaTech	The Mobilitydata.gv.at platform serves as the National Access Point of Austria for mobility data. The platform is an implementation of the national ITS-law….	Austria	Static / Dynamic	GTFS, NeTEx	CSV	Y	https://mobilitydata.gv.at/en/tutorial		DE/EN
3c5c2882-0b73-4e34-9ab8-934f4286f23d	NAP Denmark (Dataudveksleren)	The portal du-portal-ui.dataudveksler.app.syndev.vd.dk is a national service in which we gather information on, and provide you with access to, mobility data.	Denmark	Static / Dynamic	DATEX II, DATEX II with definitions, SIRI.	CSV, Excel, Txt, PNG, JSON, GML2, GML, SHP, WMS, WFS	Y	https://du-portal-ui.dataudveksler.app.vd.dk/		DA/EN

Table 4: Inventory of data sources (for the moment the URIs are fictive but they are based on real URI's created by CKAN).

The figures below (Figure 1) show how source “organisation” metadata, like the one in our inventory, could be displayed in a CKAN catalogue and how the catalogue would be structured using the Resource Description Framework (RDF) - Data Catalog Vocabulary (DCAT).

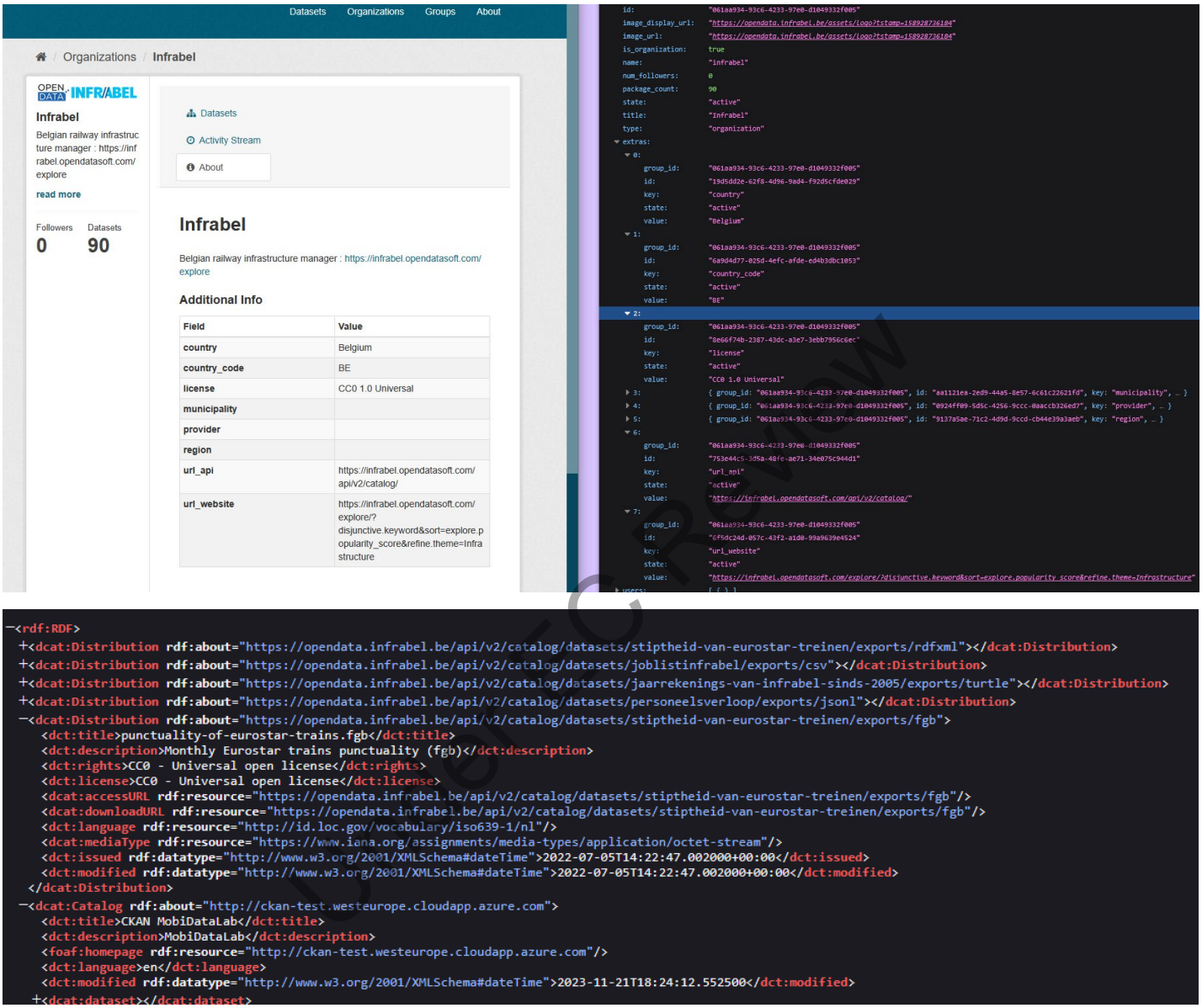

Figure 1: Example of an organisation (source) metadata on a CKAN catalogue.

In Figure 1, Image 1 (top left) presents the front-end. Image 2 (top right) shows the JSON representation of an organisation on a CKAN Application Programming Interface (API). Image 3 (bottom) shows an RDF/DCAT endpoint in XML format.

2.1.3.2 DATASETS WITH PERSONAL DATA

Within the project, some work packages and pilots might need to collect and process authentication to access data services and personal data, for example: names, addresses, dates of birth, signed consent forms, email addresses, telephone numbers, video material and photographs. This data can concern project partners and stakeholders, and its sources can come from diverse possible

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sources, Table 5 shows possible data sources and the appropriate protection measures to be taken. The collection and processing of this type of data must comply with the requirements set out in the GDPR (for more information please refer to chapter 4.1.1 on).

DATASETS	DESCRIPTION	SOURCE	PERSONAL DATA (Y/N)	USERS	PROTECTION MEASURE
Interviews	Interviews for gathering feedback on transport and traffic management aspects.	Audio or video record.	Yes	Access to personal data only by interviewers.	Controlled access
Surveys	Filled surveys	Questionnaires in different formats (Microsoft office format (Word, excel, power point, forms) or Google documents (docs, sheets, slides, or forms).	Yes	To be defined	Controlled access
Contact lists of stakeholders	Documents containing personal data like names and having a signature.	Letter of Support.	Yes	To be defined	Controlled access
Historical tracking information	Datasets containing the localisation of a person.	Google timeline, trajectories, or other.	Yes	To be defined	Controlled access
Attendance report from pilots	Documents containing personal data like names, organisation, etc.	Participation tracking activities involving pilots.	Yes	To be defined	Controlled access
Pilot participation lists	Documents containing personal data like names, organisation, etc.	Tracking of on-site workshop participation.	Yes	To be defined	Controlled access
Stakeholder preferences and cooperation specifications	Documents containing preferences.	Questionnaires in .xlsx format used for the development and calibration of the consensus mechanism.	Yes	To be defined	Controlled access

Table 5: Personal datasets sources

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2.1.4 DATA ORIGIN

These datasets were or will be gathered from public authorities, institutions and others from open data portals (released under an open license that allows us to use the data for research and non-commercial purposes). Many open data is easily accessible on the National Access Points (NAPs) as well as on regional and municipal data portals. You can see three examples in Table 4. Other datasets might have a more restrictive access and might require a smart contract to access them (where restrictions on its use might apply). These types of datasets can be found often in data spaces, marketplaces and open data portals with premium options (it can also be the case of certain transport and mobility companies).

The data will be downloadable directly from the websites of the respective organisations, in general, e.g., the “data.gv.at” website. Although some of the data could be stored on the FEDORA repositories, the Comprehensive Knowledge Archive Network (CKAN) catalogue or the dataspace for further processing and visualisation, it is metadata that will be handled and not data itself. On CKAN, for instance, a resource will be associated with a dataset's metadata to link to the source and storage of the dataset.

During the project, and in most cases, data will be collected/harvested from secondary sources such as open data portals, public administration websites, private and public road operators (measures, sensors (video recording)), results from previous analysis or analysed data from private sector and open databases (OpenStreetMap). Some data will be derived from external models (geographical and traffic models) and software. Another portion will be created, developed, generated or conducted within the project, such as minutes transcripts, documentation, code, models, first-hand simulations (on activity, travel diaries and individual trajectories on a multimodal network) and algorithms, survey-based and interview-based, which will be provided by partners and stakeholders (specifically, service providers). Documentation and metadata will be provided for new datasets. In Table 7: Inventory of data categories and formats of data generated**Erreur ! Source du renvoi introuvable.**, detailed data will be given about the origin of the data handled within the project.

2.1.4.1 DATASET AND METADATA FIELDS

The metadata of the different types of datasets collected and shared within the project will be assembled. The aim is to improve and maximise access to, and re-use of, research data generated by Horizon Europe projects by following recommended practices that facilitate the exchange of metadata related to mobility and to Intelligent Transport Systems (ITS). **Erreur ! Source du renvoi introuvable.** can be used as a guide on how to describe the metadata of the datasets gathered. An example of a dataset metadata gathered is available in Annex II (Table 10).

The description of the different datasets should provide information regarding their source, name, description, publisher, format, date of release, standard or specification, and other mandatory fields. This is shown in **Erreur ! Source du renvoi introuvable.**, which is a template that can be used to describe the datasets of the project. This template follows the mandatory fields of the mobilityDCAT-AP[8] specification for describing mobility datasets, dataset series, and services, which is planned to be used for harvesting mobility datasets from other data portals.

[8] https://github.com/mobilityDCAT-AP

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DATASET FIELDS (MOBILITY-DCAT.AP/CKAN)	METADATA REQUISITE (MANDATORY, RECOMMENDED, NOT MANDATORY)	DATASET METADATA VALUE
Dataset Identifier (dct:identifier)	mandatory	A unique identifier for the dataset.
Name of the dataset (dct:title)	mandatory	A name or brief description of the dataset (ideally not too long)
Description (dct:description)	mandatory	Brief description of the data features and the purpose of the data
Dataset publisher (dct:publisher)	mandatory	The entity responsible for making the dataset available.
Dataset provider (mobilitydcat:dataProvider)	not mandatory	Person or intituition responsible for its collection, curation and storage. If different persons or institutions are responsible for different steps of the data management process, if possible, include here all of them along each responsibility. (collection, curation and storage)
Dataset owner	not mandatory	Owner of the data (might not be the provider).
Dataset release date (dct:issued)	mandatory	The date when the dataset was first published.
Dataset modification date (dct:modified)	mandatory	The date when the dataset was last modified.
Dataset update frequency (dct:accrualPeriodicity)	recommended	The frequency with which the dataset is updated.
Dataset theme (dcat:theme / mobilitydcat:theme)	mandatory	The category, collection or theme of the dataset, typically using a controlled vocabulary.
Dataset keyword (dcat:keyword)	mandatory	Keywords or tags describing the dataset.
Dataset distribution (dcat:distribution) (dcat:accessURL)/ (dcat:downloadURL) with format/ media type (dct:format)	mandatory	Information about how the dataset can be accessed, including: Distribution Access URL (dcat:accessURL)/ Distribution Download URL (dcat:downloadURL) Distribution Format (dct:format), for instance: Doc, pdf, api, json, xml
Mobility data type (mobilitydcat:dataType)	recommended	The type of mobility data (e.g., real-time, historical, predictive).
Mobility data standard/ specification (mobilityDataStandard)	recommended	
License (dct:license)	mandatory	The license of the dataset or a link to it.
Spatial (dct:spatial)	recommended	The geographical area covered by the dataset.
Dataset Spatial Resolution (dcat:spatialResolution)	recommended	The granularity of the spatial data.
Language (dct:language)	mandatory	ISO code of language - Language in which the dataset content is provided - Language in which the dataset being described is provided - Language in which the metadata menu is provided

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Ethics and legal aspects	Mandatory if there are ethic or legal aspects	Any ethics and legal aspects of the data contained must be indicated.
Dataset quality Information (dct:conformsTo)	recommended	Information about the quality and conformance of the dataset
Dataset documentation (foaf:page)	optional	Links to additional documentation related to the dataset.

Table 6: Dataset metadata template

2.1.5 DATA TYPES, FILE FORMATS & SIZE

The CKAN metadata catalogue will allow the discovery of static, dynamic, real-time, and historical data for procedures, research, and/or data analysis; thus, making data findable. Here are some examples of the expected types of input and output data:

Input data includes:

- Transport data
  - Mobility traces (vehicle positions, speeds)
  - Transport network structures
  - Timetable data
    - Public transport schedules (General Transit Feed Specification (GTFS))
  - Public network graph
    - static traffic model
    - near real-time traffic model
- Model data
  - Model parameters
  - Scenario data
  - Statistics data
    - Static traffic modelling data (multimodal)
- Governance and metal model data
  - Documents and graphics
- Geodata
  - OpenStreetMap-based road networks
- Floating car data (FCD): measurements from dedicated fleets
- Video data
- Algorithms
  - Object detection algorithms
- C-ITS data
- Sensor data
  - Traffic counts or sensor data
  - Real-time traffic counts (measurements from stationary detectors)
  - Probe vehicle data
  - Cameras detecting Automatic Number Plate Recognition (ANPR) from vehicles
- Survey data
  - DMP survey data
  - Traffic survey data

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- Emissions

Output data includes:

- Performance KPIs (average trip times, modal shares)
- Visualizations and scenario comparison metrics
- Travel time matrices
- Traffic model
- Traffic situation information
- Traffic demand and routing choices analysis
- Average planning flows
- Near real-time traffic model
- Social optimum model
- Policy measure packages for decision-makers at EU, national, and local levels
- Build on models developed from project datasets to design new coordination systems
- Policy recommendations to advance optimised MTM in both urban and rural contexts
- Synthetic trajectories
- Simulation outputs
- Mental models and governance for FEDORA
- FAIR data sharing measures
- Network performance indicators/measurements (congestion, delays)

The expected weight of most of the data is in gigabytes (GB). If we cumulate all the different types, considered at this point of the project, we expect more than 60GB a day (about 31GB are required for the traffic models, and other tasks require several GB).

The table below (Table 7) summarises the categories, types, formats and sizes which are expected to be used, generated and collected during the project. The formats are organised by the level of probability of long-term preservation (high, medium or low likelihood of preservation). These format recommendations are based on Cornell's Digital Repository[9], but also from the UK Data Service[10] for data sharing, reuse and preservation. The consortium partners are encouraged to prioritise the use of highly recommended data formats.

Data ORIGIN	Type	Format USED in the project		
		Highly recommended	Medium	Low
Administrative data **Algorithm** **Delivery/report** **Measures (from sensors or logs)** **Training Material** **Publications / Communication Material**	Text, qualitative data, documentation and scripts. (primary/secondary, self-developed)	PDF/A-1 (ISO 19005-1) (*.pdf), Plain text (encoding: USASCII, UTF-8, UTF-16 with BOM),	Plain text (ISO 8859-1 encoding), Cascading Style Sheets (*.css), DTD (*.dtd), PDF (*.pdf) (embedded fonts), HTML (include a DOCTYPE	

[9] https://guides.library.cornell.edu/ecommons/formats
[10] https://ukdataservice.ac.uk/

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Desk research Documentation Mechanism / Policy Results, Minutes		XML (includes XSD/XSL/XHTML, etc., with included or accessible schema)	declaration), Microsoft Word 2007 or newer (*.docx), OOXML (ISO/IEC DIS 29500), Open Office (*.sxw/*.odt), Rich Text Format 1.x (*.rtf), or SGML (*.sgml).	
Presentation of report, results, demonstration.	Presentation (primary)		OOXML (ISO/IEC DIS 29500) (*.pptx), OpenOffice (*.sxi/*.odp), or PowerPoint 2007 or newer (*.pptx).	PowerPoint 2003 or older (*.ppt)
Surveys **Instructions** **Results**	Spreadsheet / database (secondary/primary)	Character delimited text (ASCII or Unicode preferred): Comma Separated Values (*.csv), Delimited Text (*.txt), SQL Data Definition Language, HDF5 (.h5, .hdf5), SIARD, NetCDF (.nc), or Apache Parquet (.parquet).	OOXML (ISO/IEC DIS 29500) (*.xlsx), Excel 2007 or newer (*.xlsx), OpenOffice (*.sxc/*.ods), DBF (*.dbf), or Feather (.feather).	
Recordings **Object detection algorithms** **Webinar**	Video (primary (self-developed/ collected/ measured) /secondary)	AVI (uncompressed/native, motion JPEG) (*.avi), Motion JPEG 2000 (ISO/IEC 15444-4)??*.mj2), QuickTime Movie (uncompressed/native, or motion JPEG) (*.mov).	MPEG-1, MPEG-2 (*.mpg, *.mpeg, wrapped in AVI, MOV), MPEG-4 (H.263, H.264) (*.mp4, wrapped in AVI, MOV), or Ogg Theora (*.ogg).	
Raw data **Metadata** **Interview data**	Audio (primary)	WAV (96kHz 24bit PCM) (*.wav), or AIFF (96kHz 16bit PCM) (*.aif, *.aiff).	Advance Audio Coding (*.mp4, *.m4a, *.aac), Free Lossless Audio Codec (*.flac), MP3 (MPEG-1/2, Layer 3) (*.mp3), Ogg Vorbis (*.ogg), Standard MIDI (*.mid, *.midi), or SUN Audio (uncompressed) (*.au).	
Desk research **Scientific output**	Raster data / Digital image data	JPEG2000 (lossless) (*.jp2),	JPEG/JFIF (*.jpg), JPEG2000 (lossy) (*.jp2), BMP (*.bmp) but only if created in this format,	

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	(primary (developed/ created)/ secondary source)	PNG (*.png) but only if created in this format, or TIFF (.tif, .tiff) uncompressed.	Digital Negative DNG (*.dng), TIFF (compressed), GIF (*.gif), or Digital Imaging and Communications in Medicine (DICOM) (.dcm, .dcm30) – for CT/MRI data.	
Metadata	Data catalogue vocabularies / Data exchange description frameworks (secondary source)	DCAT (RDF/XML, Turtle, JSON-LD), ISO 19115/19139 (XML), INSPIRE (XML), Dublin Core (RDF/XML), SensorML (XML), or FGDC CSDGM	NetCDF(CF), HDF5 (with embedded metadata), GeoPackage (SQLite), GTFS metadata (TXT, README)	
Activity and travel diaries. **Individual trajectories on a multimodal network.**	Simulations (primary generated/simulated)	(*.sumocfg, *.net.xml, *.rou.xml, *.tls.xml), MATSim (.plans.xml, .events.xml), GTFS, OSM XML/PBF, GeoJSON (.geojson).	(.xml.bz2, .xml.gz), TraCI Protocol Logs (.trc, .tr), Binary logs, MDS, CSV, or JSON.	
OD flows and travel models	matrix of data (secondary source)	Tab-delimited file (.tab). FITS (Flexible Image Transport System)	Widely-used formats: MS Excel (.xls/.xlsx), MS Access (.mdb/.accdb), or OpenDocument Spreadsheet (.ods).	Propietary Formats of PTV Visum (*.ver)
Database **Public Administration** **Private dataset**	Geospatial data Database data AIS data (secondary source)	Shapefile (essential – .shp, .shx, .dbf, optional – .prj, .sbx, .sbn), GNSS data (.lat / .lon) - (e.g., RINEX), GeoPackage (.gpkg), GeoJSON (.geojson), GML (.gml), OSM XML (.osm.bz2), daily (.osc.gz) /PBF (.osm.pbf).	ESRI Geodatabase format (.mdb), Tabular GIS attribute data, or GNSS data (e.g., NMEA logs).	
Desk research **Analysis from previous results** **Derived/Generated data from external/internal model/software** **Public network graph** **Statistics data** **Survey data** **High-frequency vehicle trajectory data (e.g., GNSS)**	Model data (primary (generated) / secondary (derived))	HDF5 (.h5, .hdf5), NetCDF (.nc), MATSim (.plans.xml, .events.xml), Apache Parquet (.parquet). GeoPackage (.gpkg), or	CSV + JSON Schema, MATLAB (.mat), Zarr, Compiled / Executable files (EXE, *.class, COM, DLL, BIN, DRV, OVL, SYS, PIF),	

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Traffic sensor logs (inductive loops, radar) **Derived data from GIS models**		GeoJSON (.geojson).		
Software	Software/programming language (primary (generated) / secondary (derived))	Uncompiled computer program source code (*.c, *.cpp, *.java, *.js, *.jsp, *.php, *.pl, *.py, etc.), R (.r), .pkl, or TextFabric.		Compiled / Executable files (EXE, *.class, COM, DLL, BIN, DRV, OVL, SYS, PIF)
C-ITS data coming from road operators **Analysed data coming from the private sector** **FCD (measurements from dedicated fleets)** **Scenarios**	Transport and traffic data (primary (collected/measured) /secondary)	C-ITS (ASN.1 (Abstract Syntax Notation One), CSV, YAML/JSON (for configs), XML (DATEX II or GTFS), INI, TOML, or Plain text (structured).	Protocol Buffers (Protobuf), HDF5 (.h5, .hdf5), SQLite, NetCDF (.nc), or Avro/Thrift.	Propietary Formats of PTV Visum (*.ver)
Algorithms **Infrastructure data**	Vector graphics (primary (self-developed)/ secondary (generated))	SVG (no Java script binding) (*.svg).	CAD data (.dwg), or Computer Graphic Metafile (CGM, WebCGM) (*.cgm).	Keyhole Mark-up Language (.kml), Encapsulated Postscript (EPS), Macromedia Flash (*.swf), Adobe Illustrator (.ai), CAD data (.dxf or .svg), or Binary formats of GIS and CAD packages.

Table 7: Inventory of data categories and formats of data generated

2.1.6 DATA UTILITY & RE-USE

During the project, data will be reused for research work and activities. Data will be coming from previous related projects and from several data catalogues. It will cover diverse European municipalities and regions to satisfy the different needs of the pilots. These external data sources will be reused to develop and calibrate (survey and network performance measurements data) algorithms and software, optimisation (static and dynamic traffic modelling data) and geospatial analysis (Geographical Information Systems (GIS) models).

The data generated, collected and developed within FEDORA will be useful for researchers and practitioners, transport authorities (including River Information Services (RIS) providers), public administrators (city decision makers/ municipalities), road and traffic management operators, research institutions, stakeholders, private companies, particularly specialised in the transport field, data

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spaces and open data sharing practices. It is not expected to be of meaningful value to the public, but it might be indirectly interesting for tourists, taxi, tourist transport companies, travel agencies and sightseeing trip organisers.

2.2 IMPLEMENTATION OF THE FAIR PRINCIPLES

This section will cover which measures will be taken by FEDORA to implement the FAIR principles.

2.2.1 MAKING DATA FINDABLE

The datasets and documents resulting from the project will be made openly available through a Zenodo repository. They will be accompanied by metadata to ensure findability and will be assigned a Digital Object Identifier (DOI) to make them citable and persistently available.

2.2.1.1 DATA SELF-DESCRIPTION

2.2.1.1.1 NAMING & IDENTIFICATION

Unique identifiers, DOI, will be assigned to the deliverables uploaded in OpenAIRE[11] and Zenodo making them citable, trackable, and thus findable. Additionally, a naming convention will be applied to all the deliverables, for which it will be necessary to indicate in the following order: <Project Name>, <Deliverable, Task, or WP Code>, <Title> and <Version number>.

- The Deliverable, Task, or WP Code as defined in the Grant Agreement.
- The title of the document is named as in the Grant Agreement or abbreviated if it is too long (it should be written using upper cases).
- The version will have the format v'x'.'y', where 'x' and 'y' are progressive ordinal numbers.
- Whenever there is a new version of an article, deliverable, or demonstration, this is must be written.

All draft and final deliverables will be stored on the SharePoint, ensuring centralised access and version control.

Additionally, quality management tracking tools and procedures will available via the platform, supporting consistent and transparent project oversight.

2.2.1.1.2 DATA VERSIONING

As mentioned above each deliverable will be assigned with an indicative ordinal number of its version.

Developers will collaborate, track changes and create backups of different code versions through Git and GitHub to procure quality assurance and appropriate data cleansing. While most of the development repositories will be open and shared with the research community, sensible repositories will be configured as private and accessible only to selected users or a group. Each version should have a unique number.

[11] OpenAIRE is a socio-technical infrastructure for Open Scholarly Communication in Europe (https://www.openaire.eu/).

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2.2.1.2 (META)DATA

2.2.1.2.1 METADATA CATALOGUE

The metadata of technical datasets will be discoverable via the CKAN catalogue, which will be part of the data space. This catalogue will be initially fed by the inventory of datasets and sources gathered within the project. The metadata will be harvested by using recommended specifications for mobility data, such as mobilityDCAT-ap, otherwise the regular DCAT and RDF metadata vocabularies and in some cases geospatial-based standards such as Catalogue Service for the Web (CSW), INSPIRE, GeoDCAT-AP or GeoDCAT. These same standards can be used to extract the metadata from the platform. Digital Object Identifiers are created in the CKAN data catalogue as the metadata is harvested or directly entered. Metadata can then be indexed. The metadata of deliverables will be created via the Zenodo platform and OpenAIRE, these platforms assign a unique digital object identifier to each document/dataset registered entered.

Search keywords will be provided in the metadata to optimize the possibility for discovery and for potential re-use.

In the scope of dynamic smart contracts for data sharing, WP3, it is expected to generate metadata identifying the trail of datasets between users.

Intelligent Transport Systems (ITS) services rely on accurate and up-to-date data. A first step to data quality assurance in our processes is to maintain metadata as fresh as possible from its source by doing frequent updates and avoiding any degradation of its quality. In FEDORA, we aim to have harmonised and qualitative data. T3.1 “Standardised and interoperable future mobility data management” will follow closely (meta)data standards and address possible obstacles for interoperability and data quality. This task will specify a framework of interoperable, standardised interfaces and data formats enabling cross-sectoral co-operation and mobility data exchange. It will define technical requirements and guidelines supporting the implementation of the data space in general and the data catalogue. Additionally, FEDORA will follow closely the Quality Frameworks for National Access Points (meta)data[12] proposed by NAPCORE[13] to be able to get an idea of how to assess certain data that will be used in our project. Other measures to clean and verify the quality of our (meta)data will be proposed in a next version of the DMP (for instance: putting into place a Standard Operating Protocol will be contemplated).

For information on quality assurance and control within the project, please refer to chapter 5 of D1.1.

2.2.1.3 DATA STORAGE SOLUTION

The solutions for storing the project’s data will differ according to the type of data collected or developed. Storage of internal and administrative data will be saved in a SharePoint repository, which enables secure, backed-up storage and sharing of key documents and deliverables between all partners. This centralised platform will permit consistency, version control, management, communication, and it will facilitate efficient coordination between partners. Publicly approved reports, generated datasets and deliverables will be made available on Zenodo and OpenAIRE. OpenAIRE grants access to the publications and bibliographic metadata in a standard format. While mobility and technical data, as well as processing tools and solutions for analysis, will be stored in a cloud-based data storage infrastructure of the dataspace that can handle large data volumes.

[12] https://napcore.eu/quality/
[13] https://napcore.eu/

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At this stage of the project, only AIS data has been identified has possibly having a retention policy since it is classified as sensitive data, although this might differ in the case of anonymous data. This subject will be developed in a future version of the data management plan.

It has not been done for this version, but for a future version of the DMP, appropriate arrangements could be explored for data storage in relation to the appropriate security level classification. Theres is a tool proposed by the Vrije University Amsterdam called "Basic Research Data Classification Tool".

2.2.1.4 ZENODO REPOSITORY

FEDORA must provide frequent updates of its Data Management Plan and open data must be put into a public research data repository. FEDORA has chosen ZENODO (Figure 2) which must be associated and be compliant with OpenAIRE (Figure 3) to enable metadata harvesting. The accounts[14] [15] for FEDORA have already been created.

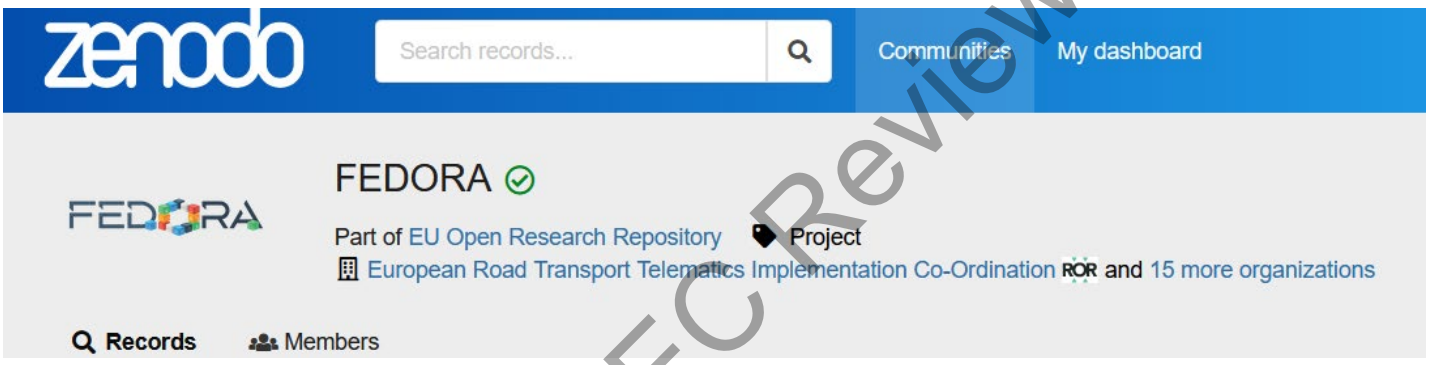

Figure 2: FEDORA's Zenodo account

[14] https://zenodo.org/communities/fedora/records? t
[15] https://explore.openaire.eu/search/project?projectId=corda_____he::9e92f918fef9c3fec2394ce92927934a

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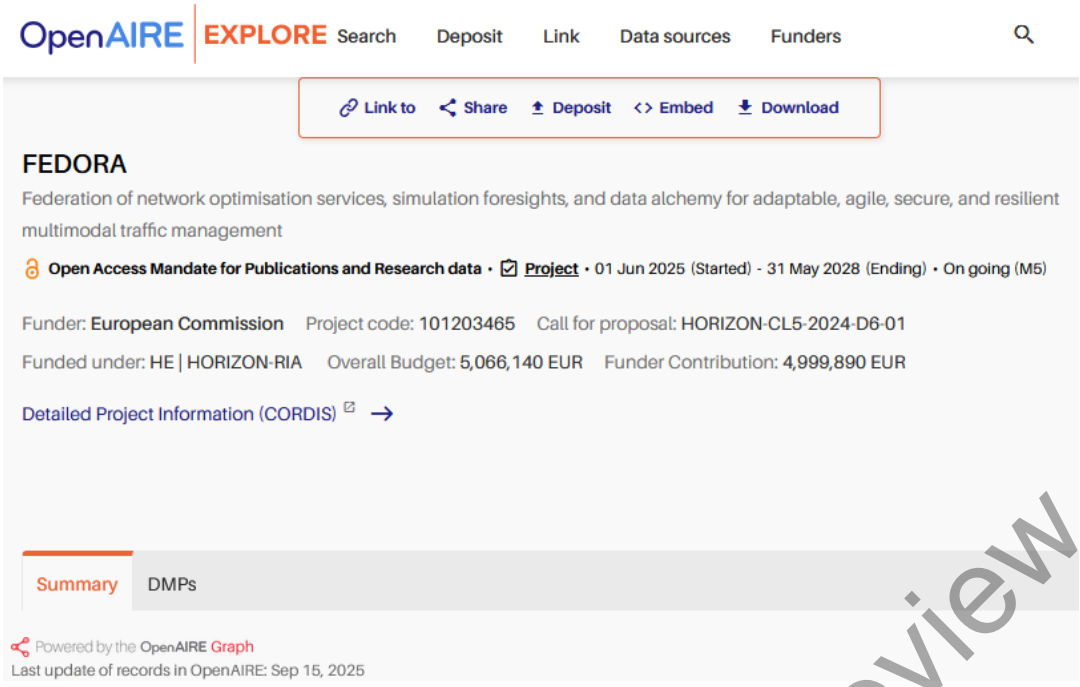

Figure 3: OpenAIRE - FEDORA

2.2.2 MAKING DATA ACCESIBLE

FEDORA aims to make most of the data openly available through a free and standardised access protocol, but this will not apply to all the data. At the current state of our research, it was identified that certain data might not be published under open access conditions since some data sharing might require a smart contract to be signed to a grant access agreement. The reasons for this restriction are related to public funding of service obligations and intellectual property rights of third parties. Measures will be taken to accomplish GDPR & specific measures to anonymise references to use-cases and user profiles. Generated datasets with personal data will be made openly available to the research community only after anonymisation and appropriate saucerisation measures.

An embargo period before sharing certain data of the project might be needed. However, for the moment, it is not clear for how long and for which data exactly. Therefore, this point will be addressed in one of the following versions of this delivery, once we have more precision about it from the data managers.

Specific software will be needed to access and analyse certain data, for instance Word, Excel, PDF-reader, QGIS, and others.

During the project, access to datasets will be provided via the dataspace and data catalogue through appropriate and lawful measures and/or specific conditions of use. The datasets generated within FEDORA development and in the use of the demonstrations will be available for research purposes, unless restrictions apply, after being subjected to appropriate anonymisation and securitisation measures.

Most of the deliverables are public (fully open or automatically posted online) and only a few are sensitive (limited under the conditions of the Grant Agreement): D1.1, D6.1, D7.2 and D7.3.

Documentation guides, training material, instructions and demonstrations about relevant software needed will be provided whenever is appropriate (e.g. in open-source code).

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2.2.2.1 OPEN DATA VS NON-OPEN DATA

In terms of open data versus non-open data, certain datasets that will be collected during the project might be sensitive, making them non-open at first. Other datasets might have restricted access for other reasons related to property rights and license restrictions. In these types of cases, data will not be made open access. However, privileged access might be granted by accepting stipulated user restrictions after the data has been anonymised for its re-use. This is the case where smart contracts would enter. Any non-open data used or created will be stored in a private repository, an input-data tag (in addition to the respective WP tags) will be assigned to it, and it will be associated with a group of "non-open data" used by FEDORA. At this stage of the project, it is not possible to elaborate on the details of how non-open data will be handled. We encourage you to read the deliverables D3.2 "AI-Enhanced Data Utilisation and Smart Contracting: AI-driven data utilisation tools and smart contract mechanisms for data sovereignty and sharing" of WP3 due on M15 and particularly follow the work of T3.5 on "Smart contracts for data sovereignty and sharing". The data management plan will explore this subject carefully in a later version. It is important to mention that no monetisation is expected from the exchange of non-open data within FEDORA's data space.

2.2.3 MAKING DATA INTEROPERABLE

Data produced by FEDORA will follow widely accepted data formats, standards and specifications to make data interoperable and allow its exchange and re-use. The main ones identified by our partners to be followed are: data exchange standard for exchanging traffic information (DATEX II), JavaScript Object Notation (JSON), GTFS, General Bikeshare Feed Specification (GBFS), Network Timetable Exchange (NETEX), DCAT, General Transit Feed Specification Realtime (GTFS-RT) and Service Interface for Real-time Information (SIRI).

Existing standard vocabularies will be used in the project as much as possible. At this point in the project, it does not seem necessary to create project-specific ontologies or vocabularies.

A proprietary software and format might be used in the context of the project. If this is the case, whenever it is possible we will aim to make data interoperable and reusable for others by proposing the conversion of proprietary formats into open files formats.

As recommended by the GO FAIR[16], to create a meaningful connection between the (meta)data of datasets and enrich context, whenever data or datasets from previous research are used, qualified references to this data will be provided in a dedicated place (*I3*, n.d.). This requires:

- the link or association of how a dataset builds into another (a description),
- a cross-reference that explains its intent,
- any complementary details, particularly if it is stored in a different dataset, and
- proper citation with information about its unique and persistent identifier.

2.2.4 MAKING DATA REUSABLE

FEDORA will provide documentation needed to validate or reproduce data analysis and facilitate data re-use. We recommend that our partners share and use codebooks, readme files and documentation in a common GitHub repository for the project.

[16] https://www.go-fair.org/

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To permit the widest re-use and access possible of data, most of the datasets created within the project and available on the metadata catalogue will be freely available, as most of it is open data. These datasets will follow open standard licenses, such as "Creative Commons BY 4.0"[17]. The software developed within FEDORA will also follow Open Licenses, and if it is pertinent, it will be submitted to an open-access journal for research review.

The data produced and used in the project will be usable by third parties, as open data will remain open, and the data will remain accessible for at least five years following the project.

Data origin will be traced and documented from the beginning of the project with the creation of an inventory and storage history. Datasets harvested will pass by data standards which require, as a mandatory metadata field, their provenance information (publisher, date of release and distribution).

2.3 ALLOCATION OF RESOURCES

In the project, AKKODIS plays the role of data manager and liaises with the Executive Committee of the project about data management issues. The Data Manager leads Data Management Plan tasks and participates in the project coordination, monitoring the evaluation of data collection, storage, handling, and publication.

The partners in FEDORA take responsibility for the collection, management, and sharing of the research data. All research data collected as part of this project is owned by the data producer or partners involved in the pilot demonstrations. The quality assessment will fall under the responsibility of the data manager of each work package and pilot.

Currently, the costs that will be incurred for making data FAIR in our project are not foreseeable. Nevertheless, the costs to make the data FAIR shall be handled by each partner who must generate data according to the requirements expressed in this Data Management Plan. Regarding the data and metadata stored in the Zenodo and OpenAIRE repositories, for the moment there are no expected cost as they are free of charge.

2.3.1 ROLES AND RESPONSABILITIES

Data management can be complex and requires the involvement and work of representatives from diverse work packages. For this, during a survey regarding data management, participants were asked to appoint Data Managers (refer to Table 8) who would be responsible for the management and control of the data retrieved and handled by each WP throughout the project. The data managers will be responsible for collecting and providing information about the datasets collected by their work package team. They will be equally accountable for the quality assessment of the data and proper management (including storage and sharing of research data). They shall provide information to determine which data has to be secured (anonymised, encrypted & restricted), stored, and for how long (according to its costs and potential value), so pertinent measures can be taken. ERTICO (ERT) will handle the project's contractual data and the project's work documents in the SharePoint. ERTICO as the project coordinator is also responsible for ethical governance of the project.

In terms of curation and as the Ethics and Data Protection Manager, AKKODIS (AKKIS) will be responsible for data management (reference the datasets, store metadata, smart contracts and authentication data) and quality assurance. AKKIS acts as the point of contact for Data Protection Issues and as Data Protection Officer (DPO) in the project.

[17] https://creativecommons.org/licenses/by/4.0/

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WP	Organisation	USERS	PROTECTION MEASURE
WP1	ERT AKKIS	To be defined	To be defined
WP2	ERT ITS-VIE VIE	To be defined	To be defined
WP3	AKKIS	To be defined	To be defined
WP4	FRONT	To be defined	To be defined
WP5	To be defined	To be defined	To be defined
WP6	AIT ITS-VIE UCY DTU VIE	To be defined	To be defined
WP7	ERT	To be defined	To be defined

Table 8: Appointed data managers by WP

Information about the roles regarding quality management can be consulted in D1.1 chapter 5.1.5.

The infrastructure to preserve and archive the created technical datasets and tools will be maintained and backed up for at least five years after the project has ended, including but not restricted to publications and presentations (refer to 2025.05.12 FEDORA Consortium Agreement v1.0 for more details). For publications and code, shared data that will be stored for an unlimited period on Zenodo, OpenAIRE and GitHub (the period has not been defined). However, we are aware that the Research Data and Software Management Policy stipulates that publications related to research data and software should be stored for at least ten years (*Research Data and Software Management Policy – Research Support Handbook*, n.d.).

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3 SAFETY & SECURITY OF DATA

3.1 SECURITY OF DATA

The FEDORA consortium gives the highest priority to the security of all data generated, collected, or used during the project. State-of-the-art technologies will be applied for the secure storage, delivery, and access of information, as well as for managing user rights to the data produced within the consortium. These measures ensure that only authorised individuals can access, store, and transmit project data. The consortium has adopted technological, procedural, and organisational safeguards to ensure an adequate level of protection during data processing, guaranteeing privacy, availability, integrity, and system resilience.

Security mechanisms will include strong encryption standards (for example, Advanced Encryption Standard (AES)), secure communication protocols (for example, Transport Layer Security (TLS)), and access control mechanisms (for example, Role-Based Access Control (RBAC)). These represent current best practices for ensuring data confidentiality, integrity, and controlled access within the FEDORA ecosystem. The design and implementation of these mechanisms will be defined collaboratively by the technical partners under the coordination of ERT as project coordinator. Oversight of data security, GDPR compliance, and alignment with the Data Management and Ethics Plan is organised within WP1 Project Management, where Task 1.4 Responsible innovation, ethics, open access and data management is led by AKKIS and includes data security, confidentiality, open access compliance, FAIR data, DPO arrangements, and delivery of the Data Management and Ethics Plan.

All personal and sensitive data collected during FEDORA will be stored on secure servers within the European Union, in compliance with the General Data Protection Regulation. Long-term preservation will be supported through open science practices that the consortium has committed to, including making datasets available on Zenodo and OpenAIRE where appropriate and lawful.

All datasets processed in FEDORA will undergo a classification and sensitivity assessment. Data will be categorised as public, internal project, confidential, or personal or sensitive. This classification determines the level of protection required, including encryption and access restrictions. To ensure compliance with data protection regulations, each partner will handle personal data collection and processing through its DPO, using its institutional IT infrastructure. WP1 provides overall coordination of management and compliance, with ERT as coordinator, and Task 1.4 setting and monitoring the data governance and ethics procedures.

Specific measures have been foreseen for data collected through project online channels, including appropriate privacy notices and cookie policies to ensure transparency and user consent. All partners will implement archiving and preservation procedures to guarantee long-term data availability and reproducibility. This includes regular backups, secure storage, and detailed documentation to facilitate data reuse and verification, consistent with the project's open science commitments. Organisational safeguards such as access controls, role-based authentication, logging mechanisms, and staff training on data protection and cybersecurity will further prevent misuse and accidental breaches. FEDORA incorporates data privacy, security and confidentiality into its technical approach and aligns with recognised best practices in the field while leveraging state of the art technologies identified in the project, including big data and blockchain within the dataspace and catalogue where relevant.

The consortium will develop a long-term data preservation plan to ensure data integrity, accessibility, and curation over time for future researchers and stakeholders. This plan will include strategies for maintaining data authenticity, ensuring sustained accessibility, and managing the evolution of data formats and repositories, and will be governed under Task 1.4 and the project's open science practices.

Regarding the United Kingdom, although not an EU member, the EU considers the UK's data protection regime adequate under two formal adequacy decisions adopted on **28 June 2021** — one under the **General Data Protection Regulation (GDPR, Regulation (EU)**

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2016/679)[18] and another under the **Law Enforcement Directive (Directive (EU) 2016/680**[19]. These decisions enable compliant personal data transfers and facilitate data flows between the EU and the UK without requiring additional safeguards. The **European Data Protection Board (2021**[20]**)** and the **Information Commissioner's Office (2021**[21]**)** confirm that these adequacy decisions establish a lawful basis for EU–UK data exchange under the current framework. The **European Commission (2021**[22]**)**, notes that adequacy decisions are subject to continuous review to ensure compliance with evolving data protection standards. The legal framework for adequacy decisions is defined under **Article 45 of the GDPR (Intersoft Consulting, 2023**[23]**)**.

3.1.1 ACCCESS, AUTHENTICATION AND AUTHORIZATION

Data is protected against any type of modification by the implementation of some security principles during its storage. Some security principles are listed below:

- **Authentication:** Access to FEDORA repositories and digital environments is restricted to authorised users only. An authentication system is used to handle the authentication of the users during the project. Furthermore, proper means are used to authenticate the repositories.
- **Authorisation**: Access to the project's repositories is available only to authenticated and authorised users. These categories and the rights of those users must be defined and enforced. Authorisation levels are defined according to user roles and project responsibilities, based on the principle of least privilege. Appropriate access control policies and mechanisms, including both logical and physical access control, are applied at the task and project level. These controls are reviewed periodically to maintain compliance with the Data Management and Ethics Plan and to respond to evolving security requirements.
- **Accounting:** All access to and modifications of project data are logged in secure audit trails. Logging mechanisms record user identities, timestamps, and the nature of each action, enabling full traceability. This prevents users from denying data access, alteration, or deletion and supports forensic analysis in case of security incidents. Audit logs are protected against tampering and stored in accordance with consortium data retention policies.
- **Confidentiality**: Data stored in FEDORA repositories is protected through encryption during both storage and transmission. Encryption mechanisms are applied in line with industry best practices to ensure that only authorised users can read or modify the data. Sensitive or personal data is stored on secure servers located within the European Union, ensuring full compliance with GDPR.
- **Communication Security**: Access to the repositories of FEDORA is done through encrypted communication channels such as Hypertext Transfer Protocol Secure (HTTPS) and Internet Protocol Security (IPsec).
- **Data Integrity**: The data collected during the project is protected from malicious and accidental modifications by any users during their transmission or their storage. Cryptographic mechanisms such as hash functions and digital signatures is used.
- **Availability**: FEDORA ensures that its repositories and digital services remain available to authorised users within the defined service parameters. Regular data backups are conducted to prevent data loss and to facilitate recovery in case of hardware failure or cyber incidents. Resilience measures, including redundancy and protection against Denial-of-Service (DoS) attacks, are implemented to maintain service continuity and reliability.

[18] https://eur-lex.europa.eu/eli/reg/2016/679/2016-05-04
[19] http://data.europa.eu/eli/dir/2016/680/2016-05-04
[20] https://edpb.europa.eu/
[21] https://ico.org.uk/
[22] https://ec.europa.eu/info/law/law-topic/data-protection/international-dimension-data-protection_en
[23] https://gdpr-info.eu/art-45-gdpr/

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These principles will be applied depending on the type repositories. For internal repositories all the principles above shall be applied, whereas the level of security of the different components will be defined during the architecture definition of WP2.

3.1.2 ENCRYPTION TECHNOLOGIES

Encryption technologies play a central role in ensuring data security within FEDORA's federated dataspace. The consortium implements robust and standardised mechanisms to guarantee the confidentiality, integrity, availability, and traceability of all information managed, exchanged, and stored throughout the project.

FEDORA applies a multi-layered approach to ensure data security, combining encryption, authentication, authorisation, and secure storage. All sensitive or personal data are encrypted both at rest (when stored) and in transit (during transmission between systems and partners). The consortium uses industry-standard algorithms and secure communication protocols to safeguard confidentiality and prevent unauthorised access or manipulation. Examples of such technologies include widely recognised approaches such as the Advanced Encryption Standard (AES) for stored data and Transport Layer Security (TLS) for data in transit. Actual implementation choices are determined by each partner's institutional IT policies and maintained in compliance with EU cybersecurity standards. Data are stored on secure servers located within the European Union, using institutional infrastructures managed by the consortium partners. Regular backups are performed to ensure data recovery and continuity in case of system failure or data corruption. Long-term archiving and preservation are supported through open-access repositories such as Zenodo, hosted by the European Organization for Nuclear Research (CERN), ensuring compliance with FAIR data principles and GDPR.

In addition to institutional storage infrastructures, the FEDORA consortium uses a dedicated and secure SharePoint-based collaboration platform hosted and managed by the project coordinator, ERT. This environment serves as the internal workspace for document sharing, coordination, and storage of non-public project data. Access to the SharePoint is restricted to authorised project members who are authenticated using individual credentials. Data stored in this environment benefit from enterprise-grade encryption and access control mechanisms, ensuring compliance with GDPR and the consortium's data protection policies. The platform supports version control, audit logging, and controlled access, providing a secure environment for the internal exchange of project deliverables, datasets, and management information. It complements institutional repositories, and the open-access platforms used for long-term preservation and FAIR data sharing.

Within the FEDORA federated dataspace, participants will be authenticated using verifiable self-descriptions checked by an external identity provider to ensure trust and traceability of data exchanges. Authorisation policies manage data sharing among participants and define access rights, roles, and usage conditions, following the principle of least privilege. Data transfers occur exclusively through encrypted and authenticated communication channels, and all processing operations are performed through defined, secure service pipelines that automate interactions while maintaining control and accountability.

The provision and exchange of data within FEDORA are governed by consortium and data-sharing agreements that establish responsibilities, ownership, confidentiality, and access conditions. These legal and contractual provisions ensure compliance with GDPR, intellectual property rights, and relevant national legislation. Any restrictions on data access are based on legal or contractual requirements to protect privacy, security, or proprietary information. Encryption technologies and related data protection measures are reviewed regularly as part of the project's risk management and quality assurance framework under WP1. Task 1.4 monitors and updates the implemented mechanisms to ensure alignment with current EU standards, emerging security threats, and technological advances. This continuous evaluation guarantees that all data processed in FEDORA remain secure, traceable, and accessible according to the highest standards of confidentiality, integrity, and availability.

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4 ETHICAL ASPECTS & GUIDELINES

The FEDORA project integrates ethical, social, and legal considerations across its objectives, methodologies, and expected impacts, as outlined in the Grant Agreement. This holistic approach ensures that the solutions developed within FEDORA are technically robust, socially responsible, legally compliant, and environmentally sustainable. Ethical awareness is embedded in all stages of the project, from design to implementation and dissemination. The project involves human participants both as researchers and as end users and includes the collection and processing of personal data in activities such as stakeholder engagement, surveys, workshops, and pilot demonstrations. A strong ethical framework has therefore been established to ensure the responsible and lawful management of all data and interactions with individuals and communities.

The FEDORA consortium brings extensive experience in ethically sound research, fully aligned with national and EU legislation, international conventions, and institutional requirements. Ethical compliance within FEDORA is a shared responsibility among all partners, who ensure that their activities respect ethical principles, data protection laws, and research integrity standards. Oversight and coordination of ethical and data protection matters are implemented through WP1, specifically Task 1.4 (Responsible innovation, ethics, open access and data management), led by AKKIS, which provides the operational framework and guidance for all ethics-related activities. The project coordinator, ERT, ensures that all ethics-related deliverables, declarations, and documentation are submitted to the granting authority in line with Horizon Europe obligations and the Grant Agreement.

Research activities will be carried out in compliance with EU and national data protection and ethics legislation as well as international conventions and declarations relevant to research involving human participants. These include:

- **Charter of Fundamental Rights of the European Union (2007/C 303/01)** (Charter of Fundamental Rights of the European Union, 2007).
- **Regulation (EU) 2016/679 (General Data Protection Regulation – GDPR)**, ensuring the protection of natural persons with respect to the processing of personal data and the free movement of such data (Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA Relevance), 2016).
- Where applicable: the **UK Data Protection Act 2018 (United Kingdom, 2018)** and the **Swiss Federal Act on Data Protection (Federal Assembly of the Swiss Confederation, 2020).**

While FEDORA does not have a medical/biological context, other legal and ethical frameworks that can be considered as references for their broad and universal relation to ethical themes (such as: dignity, informed consent, privacy and justice) are:

- **Council of Europe, Committee of Ministers (1990).** *Recommendation No. R (90) 3 concerning medical research on human beings* (Council of Europe, 1990).
- **Council of Europe (1997).** *Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine (Oviedo Convention)* (Council of Europe, n.d.).
- **UNESCO (2005).** *Universal Declaration on Bioethics and Human Rights.* Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO, 2005).

Ethical safeguards within FEDORA include the preparation and provision of consent forms and participant information sheets, the application of anonymisation or pseudonymisation techniques wherever possible, and strict adherence to principles of transparency and accountability.

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FEDORA also addresses the ethical challenges associated with large-scale, real-time data collection and processing. Data from connected vehicles, Internet of things devices, and environmental sensors are protected through encryption, secure communication protocols, and controlled access. The project's use of artificial intelligence and data-driven decision support systems follows the EU Ethics Guidelines for Trustworthy AI, ensuring transparency, explainability, human oversight, and avoidance of discriminatory bias. Beyond data ethics, the project ensures that the "Do No Significant Harm" (DNSH) principle is systematically integrated into its impact assessments, guaranteeing that project outcomes support environmental sustainability and societal wellbeing.

The FEDORA project is fully committed to compliance with European and national data protection frameworks. The central reference is the General Data Protection Regulation (GDPR, Regulation (EU) 2016/679[18]), which sets out the principles of lawfulness, fairness, transparency, data minimisation, accuracy, storage limitation, integrity, and confidentiality for all processing of personal data (European Union, 2016[18]). These principles are embedded in all FEDORA activities involving the collection or processing of personal or sensitive information, including surveys, workshops, stakeholder consultations, and pilot demonstrations. Whenever activities involve high-risk personal data processing (e.g., tracking, video, location data), a Data Protection Impact Assessment (DPIA) will be performed in accordance with GDPR.

- **Data Protection by Design and Default**: FEDORA operationalises compliance through the principle of data protection by design and by default (Article 25 GDPR[24]). Systems, databases, and processes are designed to ensure that only the minimum necessary data are processed, and that privacy safeguards are embedded from the outset. Practical measures include:
    - Pseudonymisation and anonymisation of personal data to reduce re-identification risks.
    - Data minimisation, not only in terms of collection but also in terms of access, processing, sharing, and retention periods.
    - Encryption and hashing to protect data both in storage and in transmission.
    - Use of trusted, privacy-focused service providers and repositories (e.g. SharePoint, Zenodo).
    - Mechanisms enabling data subjects to exercise their rights under GDPR, United Kingdom Data Protection Act[25] (UK DPA), and Swiss Federal Act on Data Protection[26], including access, rectification, erasure, and withdrawal of consent.
- **Technical and Organisational Safeguards**: Each consortium partner applies technical and organisational measures appropriate to the data they handle, under the supervision of their data protection officer. A backup and recovery policy are in place: daily copies retained for 28 days, quarterly full backups with one-year retention, and disaster recovery mechanisms. Microsoft SharePoint data are recoverable, while Zenodo preserves research outputs in CERN Data Centres in Geneva, with replicas in Budapest, using distributed storage and nightly tape backups (**CERN, 2024, Zenodo Repository**[27]). Sensitive personal data are stored securely by the collecting partner together with consent forms, in password-protected and access-controlled environments.
- **Informed Consent Procedures:** Informed consent is a cornerstone of the ethical framework adopted in FEDORA. Participants are clearly informed about the project's aims, the nature of their participation, and how their personal data will be collected, processed, and used. Consent is always voluntary, explicit, and traceable. Participants are provided with

[24] https://gdpr-info.eu/art-25-gdpr/
[25] https://www.legislation.gov.uk/ukpga/2018/12/contents/enacted
[26] https://www.edoeb.admin.ch/en/basic-knowledge
[27] https://zenodo.org

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a **Participant Information Sheet** (PIS) and a **Consent Form** (paper or electronic), written in clear and accessible language. These documents specify:

- The type and purpose of the data to be collected.
- The method of collection (for example, interview, online survey, or sensor data capture).
- The intended use of the data and assurance that published outputs will be anonymised.
- How personal data will be handled, including confidentiality safeguards and secure storage.
- Who will have access to the data, limited to authorised personnel bound by confidentiality obligations.
- Participants' rights to access their data, to withdraw at any stage without penalty, and to contact designated representatives for queries or withdrawal requests.

FEDORA partners responsible for organising workshops, surveys, focus groups, and pilot demonstrations will ensure that consent is sought prior to participation, and that individuals have sufficient time and opportunity to ask questions. Consent will be documented (either signed or digitally confirmed), securely stored, and monitored in accordance with Regulation (EU) 2016/679 (GDPR), the UK DPA 2018, and the Swiss FADP (FADP, 2025), as well as Horizon Europe ethics requirements.

- **Consent for Surveys, Workshops, and User Studies**: In FEDORA, surveys, workshops, and user studies are carried out at pilot and demonstration sites to gather feedback from stakeholders and end users on mobility and Connected, Cooperative and Automated Mobility (CCAM) solutions. Before participation, individuals are informed about the objectives, data collected, and its use for project evaluation. Participation is voluntary, and no data are collected without prior explicit and documented consent. Personal data are anonymised or pseudonymised before analysis, and results are reported only in aggregate form. Ethical oversight and GDPR compliance are ensured through WP1 – Task 1.4 (Responsible innovation, ethics, open access and data management), led by AKKIS.
- **Long-Term Data Preservation:** Research data are preserved in trusted open repositories such as **Zenodo**, which ensures FAIR-compliant metadata, persistent identifiers (DOIs), and long-term accessibility in line with **Horizon Europe's open science principles**.
- **Sensitive and Security-Related Information:** If project activities involve sensitive or security-related information, partners must obtain the necessary authorisations and follow any restrictions set by the granting authority. Any EU classified information will be handled in compliance with **Commission Decision (EU, Euratom) 2015/444**[28] and related EU security rules.

4.1 LEGAL REQUIREMENTS REGARDING THE PROJECT

4.1.1 GENERAL DATA PROTECTION REGULATION (GDPR)

Within the scope of the performance and administration of the Project and of the Consortium Agreement of the project, and as signed on the Grant Agreement, FEDORA must comply with the data protection Regulation (EU) 2016/679 (General Data Protection

[28] https://eur-lex.europa.eu/eli/dec/2015/444/oj/eng

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Regulation of the European Parliament and of the Council of 27 April 2016 (on the protection of natural persons about the processing of personal data and on the free movement of such data and relevant national data protection law applicable to said Party).

The protection of personal data and privacy is regulated throughout the EU and requires measures to be taken (limitation, data minimisation, accountability, data protection by design, etc). Since a limited number of partners will collect and process personal data, FEDORA must comply with suitable GDPR practices and European, federal and state data protection laws in their up-to-date versions. Here are presented the key principles of Art. 5 of the GDPR, which shall be satisfied by the project partners:

- Data must be processed **fairly, lawfully** and with **transparency** only for the **purpose** for which it was collected (legitimate purposes) and further processed (European Parliament & Council of the European Union, 2016).
- Data shall be **adequate, relevant** and **limited** to what is necessary for the purpose for which it is processed (European Parliament & Council of the European Union, 2016).
- Data shall be **accurate, updated,** and limited to the **purpose** for which it is processed (European Parliament & Council of the European Union, 2016).
- Data shall be **stored** in a form which permits identification of subjects for a limited time (no longer than necessary) (European Parliament & Council of the European Union, 2016).
- Data shall be processed in a way that ensures adequate security of personal integrity and confidentiality (European Parliament & Council of the European Union, 2016).

For details on the data controller pursuant, the purposes and means of processing, please refer to Article 4 no. 7 and Article 28 of the GDPR[29].

Other provisions to be considered by FEDORA can be consulted on Recital 78 and on the articles 17, 25 ('data protection by design and default'[30]), 32 and 34 of the GDPR (without consideration of exemptions):

- Data cannot be disclosed without authorisation unless there is an overriding act of law or legitimate grounds to do so.
- Subject to certain exemptions, individuals have a **right to access** the information relating to them and to ask for correction of inaccurate data.
- Information cannot be transferred beyond the European Economic Area boundaries without consent or the adoption of other adequate protection measures.
- Organisations are usually required to register or notify the processing of personal data unless the data processing is simplistic, or a data protection officer has been appointed.
- Organisations must have adequate security measures in place.

4.2 PERSONAL DATA PROTECTION REQUIREMENTS

If personal data needs to be collected, FEDORA must provide to any data providers or participants a consent form before collecting their data, and a particular procedure should be followed to obtain and be eligible as consent.

[29] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32016R0679&from=EN#d1e3063-1-1
[30] https://commission.europa.eu/law/law-topic/data-protection/rules-business-and-organisations/obligations/what-does-data-protection-design-and-default-mean_en

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HOW TO IDENTIFY PERSONAL DATA?

Personal data collected could include:

- names
- addresses
- signed consent forms
- email addresses
- telephone numbers
- video material and photographs
- institutions/companies that individuals work for
- opinions of academics and other stakeholders

4.2.1 CONSENT PROCEDURES

INFORMED CONSENT FORMS MIGHT COVER THE FOLLOWING:

- All participants must be adults (over 18 years old) in accordance with EU regulations.
- The project does not target vulnerable individuals such as children, discriminated groups, those unable to give consent, minorities, sex workers, etc.
- Participants have the right to be fully informed about the research they are involved in. They shall receive answers to their questions before deciding about participation or data sharing.
- All documents shall be presented in a language and format that is easily understandable.
- The research aims, methods, implications, nature of participation, and potential benefits, risks, or discomforts shall be clearly described.
- Participation is entirely voluntary, and individuals have the right to refuse or withdraw participation at any time without consequences.
- Personal information shall be handled securely and not disclosed to third parties or countries.

Procedures for handling unexpected or incidental findings will be outlined, including whether participants have the right to know about such findings.

The consortium has identified three possible cases in which informed forms for consent must be applied:

- Pilot activities,
- surveys, and
- tracking/geo-localisation information.

4.2.2 INTELLECTUAL PROPERTY RIGHTS (IPR)

While most of FEDORA's research data and scientific outputs will be made openly available, the project also recognises the need to protect certain knowledge and results to ensure proper exploitation, commercialisation, and sustainability of outcomes. A clear framework for Intellectual Property Rights management has therefore been established in line with the Horizon Europe IPR guidelines, the Grant Agreement, and the consortium's exploitation strategy. FEDORA's IPR management ensures an appropriate

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balance between open science principles and the protection of proprietary or commercially sensitive results. The approach follows these core principles agreed by all partners:

1. **Ownership of Background Knowledge:** Each partner retains full ownership of the background knowledge, methods, and technologies brought into the project. Background is defined before the start of the project in the **Consortium Agreement** (CA), which also specifies any access limitations.
2. **Access Rights to Background:** Access rights to background are granted to other partners on a need-to-know basis when required for the implementation of the project or for the exploitation of its results. Such access is provided under fair and reasonable conditions as detailed in the CA.
3. **Ownership of Foreground (Results):** All results (foreground) generated within FEDORA are owned by the partner(s) that produced them. When several partners jointly create results and their respective contributions cannot be separated, joint ownership applies. The joint owners will establish a **joint ownership agreement** defining terms for access, exploitation, licensing, and possible compensation.
4. **Transfer and Licensing:** Any transfer of ownership or licensing of project results to third parties must respect the conditions defined in the CA and ensure that other partners' rights and legitimate interests are not affected. Licensing to third parties will be subject to prior notification and agreement among the joint owners where applicable.
5. **Protection and Exploitation of Results:** Each partner is responsible for assessing the need to protect results through appropriate measures such as patenting, copyright, or trade secrets, in line with Horizon Europe rules. Exploitation activities include further research, product or service development, standardisation, and commercial uptake.
6. **Dissemination and Open Access:** Dissemination of project results will comply with the open-access policy defined under **WP7**, ensuring that scientific publications and datasets are made available through trusted repositories (e.g., Zenodo) whenever possible. Dissemination will not jeopardise IPR protection or commercial interests.

The strategy for IPR and innovation management is defined and monitored under WP7 – Dissemination, scale-up, standardization and exploitation, specifically Task 7.4 (IPR and Innovation Management, Exploitation Roadmap), see Table 9. This task coordinates IPR protection, supports partners in managing ownership and licensing, and links innovation management with exploitation planning. The first version of Deliverable 7.2 (IPR and innovation management, Exploitation Roadmap) will be submitted in M18, with an updated version in M36. This framework ensures that FEDORA's knowledge and results are shared responsibly, protected effectively, and exploited to maximise scientific, societal, and economic impact while remaining fully compliant with Horizon Europe.

IPR Strategy	Main Assets/Exploitable Results
Free use by partners and EU	ER#1.1, 1.2, 6.1
Copyright, free use by partners and EU	ER#1.3, 2.1, 2.2, 2.3, 3.1, 4.3, 5.1
Copyright, patent, free use by partners and associated members, Software as a Service	ER#3.2, 3.3, 4.1, 4.2

Table 9: IPR strategy and exploitable results

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4.3 GENDER EQUALITY

The FEDORA approach follows the Gender Equality Strategy 2020–2025[31], promoted by the European Commission, and Sustainable Development Goal 5 on Gender Equality.[32] It will address the needs of both female and male stakeholders. It will consider gender-specific ways of dealing with technological tools, knowledge and information products in the development of these. It will also encourage a balanced participation of women and men at all levels in its teams of innovation and its management structure (for more details, see section 3.2.1 of the PROPOSAL_101203465-FEDORA-HORIZON-CL5-2024-D6-01). Overall, all organisations involved in the project are equal opportunity employers or actively safeguard gender equality. FEDORA will consider the gender, age and physical abilities of road users in the design and specification phase, the execution phase and the evaluation and recommendations phase. In general, the consortium will follow the principles for guaranteeing responsible research. In addition to paying close attention to gender aspects, the project will adopt a "Science with and for the Society" philosophy, considering other forms of discrimination, ethics, public engagement, and education. Finally, FEDORA will create impact by increasing awareness of the benefits of a gender perspective in research, development and innovation, encouraging the participation of women in science, technology, engineering, and mathematics (STEM) sectors. In the long run, the gender mainstreaming method will contribute to favourable conditions for innovation systems and a more sustainable society.

Gender-based analysis will be integrated into project activities to ensure societal relevance and high-quality research and innovation (R&I) results. Only necessary data will be captured and processed, and all developments and datasets will be accessible and open source, supporting a multidisciplinary, participatory, and collaborative approach. The project respects fundamental rights, safety, and non-discrimination.

To assess and learn more about the consortium practices regarding gender equality, a Gender Equality Plan (GEP) will be developed. This must consist of a complete policy cycle of analysis, problem formulation, policy design, implementation and ongoing monitoring & evaluation. The policy should be a participatory design process (reflection and interaction are key elements), which will require providing sufficient financial and human resources (dedicated and committed to implement it). The results will have to be sustainable, and a dissemination and communication strategy will be required (a formal document will have to be published on the project's website and signed by the top management). These measures and responsibilities will require a timeline and a logical structure. A problem analysis should be done taking into consideration the goals, objectives, structure, measures, actions, and outputs (with precise targets, indicators and clearly defined groups). The next recommended elements and actions (recommended by the European Institute for Gender Equality) will have to be covered in the Gender Equality Plan:

- work-life balance and organisational culture;
- gender balance in leadership and decision-making;
- gender equality in recruitment and career progression;
- integration of the gender dimension into research and teaching content;
- measures against gender-based violence including sexual harassment;
- measures mitigating the effect of COVID-19.

To promote reflexivity and learning, the GEP might collect data and should be monitored. Here are the recommended activities:

- Propose training for awareness-raising and capacity building on gender equality and unconscious gender biases for staff and decision-makers.
- Follow the GEP development and implementation (specify the general governance and leadership accountability for managing the GEP, progress and results).

[31] https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/gender-equality/gender-equality-strategy_en
[32] https://unstats.un.org/sdgs/report/2025/Goal-05/

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- Develop gender-sensitive research funding procedures.

Monitoring of potential findings and measures will ensure that the integration and equity in attending to women's needs, the report of the perspective of men and women, and the prevention of mobility inequalities are addressed in the project outcomes. The main objectives in the gender equality plan are to have equal access to all areas and positions for women and men, to have more women involved in decision-making bodies and to eliminate structural barriers to women.

4.4 AI ETHICS

Artificial Intelligence (AI) is a key enabler within FEDORA, supporting data-driven decision-making for multimodal mobility management, traffic orchestration, and safety optimisation in the CCAM ecosystem. AI methods are developed and tested in several work packages, particularly WP3-WP6, to analyse mobility data, model demand, and support operational decision-making in the demonstration sites. These AI applications are strictly limited to non-critical domains and focus on improving transport efficiency, environmental performance, and user safety.

FEDORA ensures that the design, development, and deployment of AI systems are lawful, ethical, and robust, in line with the EU Ethics Guidelines for Trustworthy AI[33] (European Commission, 2019) and the GDPR, Regulation ((EU) 2016/679)[34]. The project also anticipates alignment with the forthcoming EU Artificial Intelligence Act (COM/2021/206[35]), which classifies FEDORA's AI components as limited-risk systems. Ethical oversight of AI activities is integrated into WP1 under Task 1.4, led by AKKIS, ensuring that all developments comply with EU, UK, and Swiss data-protection and AI-governance frameworks.

FEDORA follows the key requirements for Trustworthy AI defined by the European Commission. These include ensuring human agency and oversight throughout the AI lifecycle, maintaining technical robustness and safety in all systems, and upholding strict standards of privacy and data governance. The project also promotes transparency by making AI processes understandable to stakeholders and guaranteeing diversity, non-discrimination, and fairness in data use and algorithmic outcomes. In addition, FEDORA supports societal and environmental well-being through sustainable and inclusive innovation while ensuring accountability for all AI-driven actions and decisions. These principles guide the entire lifecycle of AI development and deployment within the project.

A major ethical priority in FEDORA is the prevention of bias in artificial intelligence applications. The consortium recognises that AI systems can unintentionally reproduce social or contextual bias if not carefully managed. To mitigate this risk, FEDORA's models are trained on diverse and representative datasets that reflect different mobility contexts, demographic profiles, and geographic conditions. Continuous fairness testing and sensitivity analyses are conducted to identify and correct potential imbalances. This adaptive methodology allows the project to refine its models as new data and insights emerge, ensuring that all AI-based components remain inclusive and equitable, particularly about vulnerable road users, persons with disabilities, and other potentially marginalised groups.

Explainability and transparency are equally fundamental within FEDORA's AI ethics framework. Every AI model developed or within the FEDORA is accompanied by clear documentation describing its purpose, data sources, parameters, validation methods, and limitations. For complex models, explainable AI (XAI) techniques are applied to make algorithmic reasoning understandable to both

[33] https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai
[34] https://eur-lex.europa.eu/eli/reg/2016/679/oj
[35] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0206

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technical experts and external stakeholders. This emphasis on transparency strengthens accountability and helps build trust in AI-assisted decision-making processes across the mobility ecosystem.

Accountability and human oversight are embedded throughout FEDORA's AI lifecycle. All AI tools operate strictly as decision-support systems rather than autonomous agents. Human operators remain responsible for evaluating and approving all AI-generated recommendations. Comprehensive audit trails record data inputs, model versions, and system decisions, ensuring full traceability. Regular internal reviews, coordinated by the ethics and data protection leads under WP1, verify adherence to principles of fairness, transparency, and accountability.

To uphold ethical integrity throughout the project lifecycle, FEDORA implements a robust framework for continuous monitoring and improvement. AI systems are routinely evaluated not only for quantitative performance metrics such as accuracy and fairness but also for adaptability to evolving datasets and operational environments. This reflects the risk management principles outlined in **ISO/IEC 23894:2023 – Artificial Intelligence: Guidance on Risk Management.** The evaluation framework combines technical performance assessment with ethical oversight, ensuring that system behaviour remains reliable, transparent, and aligned with project values over time. Explainability and interpretability are integrated into every evaluation phase, acknowledging that transparency is essential for accountability and stakeholder trust. This balanced approach also considers the trade-off between model complexity and interpretability, ensuring that AI outputs remain understandable and controllable by human operators (Lipton, 2018). Structured feedback mechanisms allow citizens, regulators, and mobility operators to contribute insights that improve the responsiveness and social relevance of AI-driven solutions.

All AI-related work in FEDORA complies with GDPR, the UK Data Protection Act 2018, the Swiss Federal Act on Data Protection (2025), and the OECD Principles on Artificial Intelligence (2019)[36]. Together, these frameworks guarantee respect for human dignity, individual freedom, equality, and non-discrimination throughout AI deployment. By integrating bias mitigation, transparency, and continuous human oversight, FEDORA promotes the responsible and trustworthy use of AI in European mobility systems. This approach supports the development of fair, explainable, and accountable AI solutions that strengthen public trust and enable the safe, inclusive, and sustainable deployment of CCAM technologies across Europe.

[36] https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449

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5 CONCLUSION

This deliverable (D1.2) covered the first version of the Data Management Plan of FEDORA.

In the first chapter, an introduction of the deliverable and the project were presented along with a mapping to other deliverables and tasks, particularly to those of WP1, WP3 and WP7. This section also presented the structure of the deliverable. This version of the deliverable is associated with the milestone “IGNITE” on Best practices and state-of-the-art update, dissemination plans and project management handbook available.

In the second chapter, this document provided an overview of the data processed and described the data categories of the project. It outlined the data management and implementation of the FAIR principles throughout the project, but it also presented some of the first details concerning the allocation of resources, roles and responsibilities in what concerns the data management and sharing. This was done by following the Horizon Europe guidelines, the recommendations of DMP online and other DMPs. A survey was created and answered by the consortium partners to facilitate the development of this data management plan.

In the third chapter, the focus was on the measures taken for data safety and security within the project and the implementation of security principles such as: authentication, authorisation, accounting, confidentiality, communication, security, data integrity and availability. Encryption technologies were presented as well.

In the fourth chapter, ethical aspects and guidelines were covered. As mentioned in the Grant Agreement, FEDORA is committed to follow the GDPR directive, the Gender Equality Strategy, a framework for Intellectual Property Rights aligned with the Horizon Europe guidelines and the EU Ethics Guidelines for Trustworthy AI. The implementation of these guidelines will be further explored in a next version of DMP.

The DMP and its survey will be adapted and updated continuously as new insights regarding data collection and processing emerge, but also as the project progresses.

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ANNEX I – DATA MANAGEMENT SURVEY

Here are the details of the data management survey sent to the partners.

Mail:

"Dear partners,

As part of the preparation for the delivery of D1.2 (due on M6), Akkodis must identify all the types of data that will be handled during the project to write a first version of the Data Management Plan for FEDORA. It is within this objective that we kindly ask you to fill out the following survey regarding data (formats, usage, size, sensitivity, and reuse), FAIR practices, RGPD, and ethics. It is essential to have as many responses as possible by the end of September to propose the most appropriate practices and recommendations throughout the project. If there is anyone in your FEDORA team who might not have received this email, please forward it to them.

FEDORA T1.4 Data Management Survey

If you have any questions or any trouble accessing the survey, please do not hesitate to contact me."

Data Management Questionnaire

The aim of this questionnaire is to get an overview of the data collected, processed and generated through the project to adapt the data management plan accordingly. For this purpose, we ask you to provide the information on data that you handle ***at this point*** *of the project and information that you can already provide on* ***future data activities****. Your answers will be used to complement the Data Management Plan (DMP). The DMP is a living document. It will be updated continuously during the project. New insights into data collection and processing can therefore be provided at later points in time. Thus, if you do not know yet or cannot provide the answer to a question (or if it is not relevant to your work), feel free to say "Do not know" or leave blank not mandatory questions.*

This questionnaire has also the aim to create awareness about ethic actions to be taken and recommended data formats for data sharing, reuse and preservation (according to likelihood of successful long-term preservation of data: H being/implying "high likelihood of preservation", M "medium likelihood of preservation" or L "low likelihood of preservation").

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ANNEX II – DATASETS FIELDS EXAMPLE

DATASET FIELDS (MOBILITY-DCAT.AP/CKAN REQUISITS)	METADATA REQUISITE (MANDATORY, RECOMMENDED, NOT MANDATORY)	DATASET METADATA VALUE EXAMPLE
Dataset Identifier (dct:identifier)	mandatory	94f9a8f1-6b5a-46eb-b652-0f211adbac0x
Name of the dataset (dct:title)	mandatory	Austria-wide public transport network
Description (dct:description)	mandatory	This Austrian-wide data set contains the constantly updated line network that is served by the public transport services within the area of the public transport authorities in the respective timetable period.
Dataset publisher (dct:publisher)	mandatory	Mobility Associations Austria OG
Dataset provider (mobilitydcat:dataProvider)	not mandatory	(collection) (curation) (storage)
Dataset owner	not mandatory	- Upper Austrian Transport Association (OÖVV) -Salzburg Transport Association (Salzburg Transport) -Carinthian transport association Transport Association Eastern Region (VOR) -Sty Steel Transport Association (Association Line) -Transport Association Tyrol (VVT) -Transport Association Vorarlberg (VMOBIL) -ÖBB
Dataset Release Date (dct:issued)	mandatory	2025-08-14
Dataset Modification Date (dct:modified)	mandatory	2025-08-14T05:10:05
Dataset Theme (dcat:theme / mobilitydcat:theme)	mandatory	Categories: Network Topology and Routes (Topology), Public Transport
Dataset Keyword (dcat:keyword)	mandatory	Transport networks, public transport, local transport, Austria-wide, ÖBB, public transport
Dataset Distribution (dcat:distribution) (dcat:accessURL)/ (dcat:downloadURL)	mandatory	https://mobilitaetsdaten.gv.at/en/daten/%C3%B6sterreichweites-%C3%B6v-liniennetz https://data.mobilitaetsverbuende.at/en/data-sets

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Format/ Media type (dct:format)	mandatory	csv
License (dct:license)	mandatory	Data License Mobilitätsverbünde Österreichhttps://mobilitaetsdaten.gv.at/sites/default/files/metadataset/contract_examples/Lizenzvereinbarung_DBP_v1.1_3.pdf
Language (dct:language)	mandatory	ISO code of language - Language in which the metadata fields are provided: EN / DE - Language in which the dataset being described is provided: DE - Language in which the dataset content is provided: DE
Ethics and legal aspects	Mandatory if there are ethic or legal aspects	To download data sets, it is mandatory to register and accept the license terms.
Technical aspects		None
Other		None

Table 10: Dataset metadata example

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