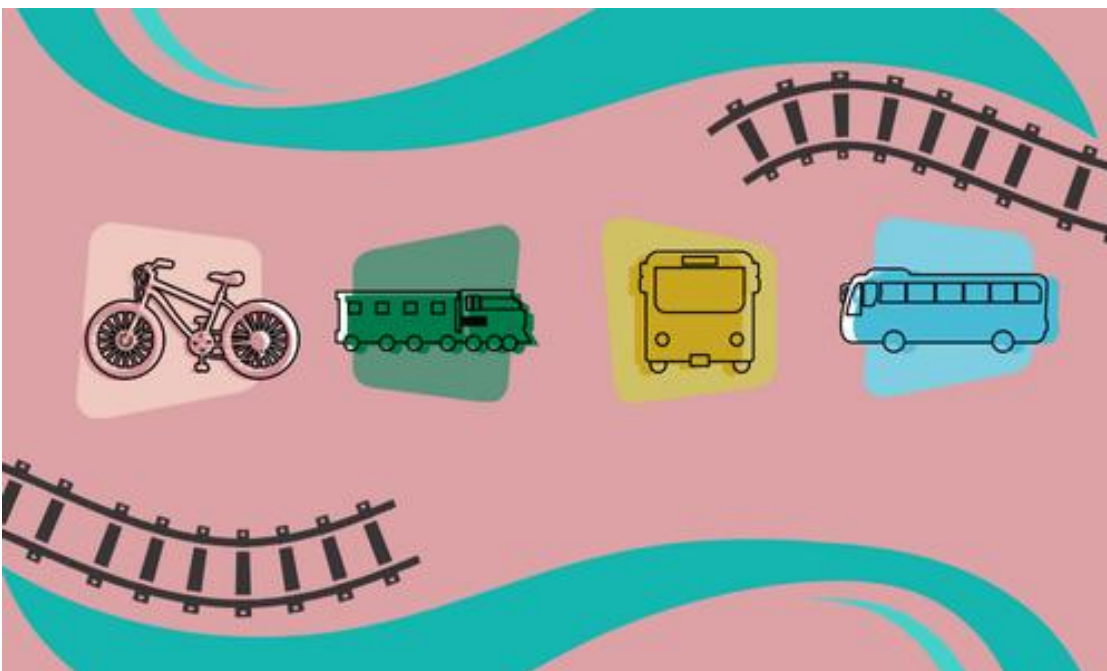


MODALSHIFT

D2.1 - Data Management Plan



Multimodal Optimisation leveraging Data Acquisition from Local Stakeholders towards a Holistic Improvement of Freight and People Transport



Funded by
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.



Project Information

| | | | | |
|----------------------------------|--|-----------------|------------------|------------|
| Grant Number | Agreement | 101203040 | Acronym | MODALSHIFT |
| Full Title | Multimodal Optimisation leveraging Data Acquisition from Local Stakeholders towards a Holistic Improvement of Freight and people Transport | | | |
| Call and topic identifier | HORIZON-CL5-2024-D6-01-06 | | | |
| Duration | 42 months | | | |
| Start Date | 1 June 2025 | End date | 30 November 2028 | |
| Website | https://modalshift.eu/ | | | |
| Coordinator | Instituto Tecnológico de Aragón (ITA) | | | |

Document Information

| | |
|--------------------------------|---------------------------------------|
| Beneficiary responsible | Instituto Tecnológico de Aragón (ITA) |
| Author/-s | ITA |
| Co-author(s) | ITA |
| Work Package | WP2 |
| Deliverable | D2.1 |
| Due date | M3 (08/2025) |



| Nature of the deliverable | | |
|---------------------------|---|---|
| R | Document, report (excluding the periodic and final reports) | X |
| DEM | Demonstrator, pilot, prototype, plan designs | |
| DEC | Websites, patents filing, press & media actions, videos, etc. | |
| DATA | Data sets, microdata, etc. | |
| DMP | Data management plan | |
| ETHICS | Deliverables related to ethics issues | |
| SECURITY | Deliverables related to security issues | |
| OTHER | Software, technical diagram, algorithms, models, etc. | |

| Dissemination level | | |
|---------------------|--|---|
| PU | Public, fully open, e.g. web (Deliverables flagged as public will be automatically published in CORDIS project's page) | X |
| SEN | Sensitive, limited under the conditions of the Grant Agreement | |

| Quality procedure | | | |
|-------------------|---------|----------|---|
| Date | Version | Reviewer | Action |
| 31/07/2025 | V1 | OCTO | |
| 31/07/2025 | V1 | AIT | |
| 23/09/2025 | V2 | EQY | Correction of EU emblem and disclaimer. Modification of Conclusions |
| | | | |



CONTENTS

| | |
|--|-----------|
| CONTENTS | 3 |
| 1 PROJECT ABSTRACT | 4 |
| 2 EXECUTIVE SUMMARY | 5 |
| 3 ABBREVIATIONS | 7 |
| 4 INTRODUCTION | 8 |
| 4.1 DELIVERABLE OBJECTIVE AND STRUCTURE | 8 |
| 4.2 BACKGROUND NOTES..... | 8 |
| 4.3 ETHICS COMMITTEE AND GOVERNANCE..... | 9 |
| 5 DATA MANAGEMENT PLAN | 10 |
| 5.1 DATA MANAGEMENT PROCESS | 10 |
| 5.2 FAIR DATA AND DATA FORMATS | 11 |
| 5.2.1 <i>Making Data Findable, Including Provisions for Metadata</i> | 12 |
| 5.3 DATA SECURITY..... | 12 |
| 5.3.1 <i>Data Security Strategy</i> | 13 |
| 5.4 DATA SHARING AND DATA TRANSFER PRINCIPLES | 14 |
| 5.5 OPEN SCIENCE, CURATION, AND LONG-TERM PRESERVATION | 14 |
| 5.6 MODALSHIFT DATA SUMMARY | 15 |
| 5.7 DATASET INTERLINKAGES AND REUSE ACROSS WORK PACKAGES | 17 |
| 6 ADDRESSING ETHICS AND PRIVACY REVIEW | 18 |
| 6.1 ETHICS SELF-ANALYSIS | 19 |
| 6.1.1 <i>Pertaining to Humans</i> | 19 |
| 6.1.2 <i>Pertaining to Personal Data</i> | 19 |
| 6.1.3 <i>Pertaining to Non-EU Countries</i> | 20 |
| 6.1.4 <i>Pertaining to Artificial Intelligence (AI)</i> | 20 |
| 7 ETHICS AND PRIVACY-RELATED ACTIVITIES IN MODALSHIFT | 21 |
| 7.1 RESEARCH ACTIVITIES..... | 21 |
| 7.2 PILOT SITE PROTOCOLS..... | 22 |
| 7.3 ETHICS AND PRIVACY INSTRUMENTS..... | 23 |
| 7.4 PROTOCOLS ON ETHICS AND DATA PROTECTION IN PILOT SITES..... | 24 |
| 7.5 ADDITIONAL CONSIDERATIONS ON ETHICS AND PRIVACY IN PILOT ACTIVITIES | 25 |
| 7.6 STAKEHOLDER ENGAGEMENT..... | 25 |
| 8 GUIDELINES FOR HUMAN PARTICIPATION | 27 |
| 8.1 HUMAN RIGHTS..... | 27 |
| 8.1.1 <i>Gender and Inclusion Considerations</i> | 28 |
| 8.2 GOOD RESEARCH PRACTICES | 28 |
| 8.3 RECRUITMENT POLICY | 29 |
| 9 CONCLUSION | 31 |
| 10 REFERENCES | 32 |
| 11 ANNEX(ES) | 33 |
| 11.1.1 <i>Annex A – Dataset Overview for MODALSHIFT</i> | 33 |
| 11.1.2 <i>Annex B – Ethics Self-Assessment Summary</i> | 34 |
| 11.1.3 <i>Annex C – Informed Consent Form Templates</i> | 35 |
| 11.1.4 <i>Annex D – Privacy Statement Templates</i> | 38 |
| 11.1.5 <i>Annex E – Ethics and Privacy Questionnaire (City and Research Forms)</i> | 40 |
| 11.1.6 <i>Annex F – Stakeholder Engagement Workshop Summary</i> | 42 |
| 11.1.7 <i>Annex G – AI Device Compliance Guidelines</i> | 43 |
| 11.1.8 <i>Annex H – Visual Consent Form (MODALSHIFT)</i> | 45 |

| | |
|---|----|
| Table 1: list of abbreviations | 7 |
| Table 2: MODALSHIFT Data Governance Principles and Compliance Measures..... | 11 |
| Table 3: MODALSHIFT Implementation of Open Science Principles | 15 |



| | |
|--|----|
| Table 4: Overview of Dataset Contributions by MODALSHIFT Partners | 16 |
| Table 5: Partner-Level Overview of Data Types and Personal Data Use in MODALSHIFT | 17 |
| Table 6: Overview of Ethics Requirements and Identified Issues in MODALSHIFT | 18 |
| Table 7: Overview of Pilot Case Data Collection and Sensitivity Levels in MODALSHIFT | 24 |
| Table 8: stakeholder and Public Target Groups Across Pilot Sites in MODALSHIFT | 27 |
| Table 9: Work Package Dataset Inventory and Reusability Tracking | 33 |
| Table 10: Overview of Identified Ethics Topics and Mitigation Measures in MODALSHIFT | 35 |

LIST OF TABLES

| | |
|--|----|
| Figure 1: Dataset interlinkage and reuse across work packages..... | 18 |
|--|----|

1 PROJECT ABSTRACT

The vision of the **MODALSHIFT** project is to create a transport network and traffic management optimisation framework, trusted and valuable for local stakeholders, that bridges the data from infrastructures, logistics and mobility operators.

New IoT devices, a smart box enabling Capacity-as-a-Service, and a e-subscription device for public transport access for vulnerable people, will increase the sources for data collection. A mobility data space, associated to novel geolocation data anonymisation, will be set up in the 3 Case Studies (Bulgaria, Italy, Spain to ensure trusted and secure data exchange between data providers and mobility ecosystem stakeholders (e.g., public transport operators, logistics partners, and authorities). This multisource data will enhance traffic state forecasting and increase the detection rate of events by 15%. On this basis, predictive and prescriptive analytics and synchromodality-based scenarios, tested in digital twins and early pilots, will identify optimal actions of transport stakeholders for adjusting their operations, towards a reduction of 25% of the interconnection or transshipment delays.

Agent-based modelling will identify how a modal shift towards low-carbon, active and shared mobility services can be acceptable by end-users and support a reshape of the public transport services and the use of urban space. A multimodal traffic management platform will orchestrate, upon the data space, the cooperation of stakeholders at network and multimodal hub scales. It enables the connection of dynamic optimisation algorithms to operational drivers' tool for mobility operators, and of static models to visual interface for transport planners. The determination of governance models, values for each stakeholder, dynamic pricing and business models, will steer the participation of 8 stakeholders for each Case Study in the multimodal traffic management system.

With this approach, MODALSHIFT stimulates new uses of the transport network to reduce traffic congestion for low-carbon and inclusive mobility, avoiding pernicious rebound effects.



2 EXECUTIVE SUMMARY

This deliverable presents the **first version of the MODALSHIFT Data Management Plan (DMP)**, which sets out principles, governance structures, and ethical frameworks to ensure that all project data is handled transparently, securely, and in compliance with GDPR and FAIR standards. The document includes defining a common governance framework, preparing consent and privacy templates, and conducting a self-assessment of ethics and privacy issues. A preliminary mapping of existing data sources and legacy systems was also completed to support interoperability and reuse.

Key findings highlight risks related to personal data and vulnerable groups, the need to clarify the role of Ethics Committees in pilot sites, and the importance of addressing cross-border data transfers. The most relevant aspects for decision-making are the availability of harmonized compliance tools, early risk identification, and a scalable governance structure. This version provides the foundation for responsible and effective data management and will be updated as the project evolves.

The purpose of this deliverable is to define the data management strategy for the MODALSHIFT project, ensuring that all data collected, processed, and shared during the project complies with legal, ethical, and technical standards. It outlines the procedures for handling personal and non-personal data, focusing on privacy, security, accessibility, and reusability in line with GDPR and FAIR principles. This DMP serves as a foundational document to guide project partners in managing data responsibly throughout the lifecycle of the project, while supporting MODALSHIFT's broader objective of enabling sustainable modal shifts in urban mobility through evidence-based interventions and stakeholder engagement.

This deliverable is primarily intended for the MODALSHIFT project partners involved in data collection, processing, analysis, and sharing, including technical teams, researchers, and pilot site coordinators. It is also relevant for the European Commission and other funding authorities for monitoring compliance with ethical and legal data management requirements. Additionally, the document may serve as a reference for external stakeholders such as ethics committees, data protection officers, and mobility planners interested in understanding how data-driven interventions in urban mobility are ethically and securely managed.

The core activities described in this deliverable centre around the development of a structured and ethically sound Data Management Plan (DMP) for the MODALSHIFT project. These activities included identifying the types of data expected to be collected across various pilot sites, classifying personal and non-personal data, outlining ethical risks, and establishing clear protocols for informed consent, privacy protection, and secure data handling. Methodologies followed the Horizon Europe guidelines and the FAIR (Findable, Accessible, Interoperable, Reusable) data principles, along with GDPR compliance standards. The DMP outlines responsibilities across project partners, procedures for anonymization and pseudonymization, and the use of tools and platforms for data storage, processing, and sharing (e.g., SharePoint, secure platforms, and survey tools). The DMP further outlines protocols for both historical and real-time data sharing, specifies standard formats to ensure data interoperability (e.g., JSON, CSV), and defines role-based access rights aligned with project governance. Integration is planned via federated data nodes using common interfaces such as NGS-LD.

The key results are:

- **Result 1:** Establishment of a structured and ethics-compliant data framework
The deliverable sets out a detailed structure for data collection, handling, and sharing aligned with GDPR and FAIR principles. This is significant because it ensures that all data activities in MODALSHIFT are transparent, secure, and legally compliant across all EU and non-EU partners.
- **Result 2:** Identification of personal data risks and ethical considerations



Through an internal self-assessment, the project identified key ethical concerns especially regarding vulnerable groups such as persons with reduced mobility. As a result, specific tools such as consent forms, privacy statements, and data minimization strategies were integrated into the data lifecycle. This strengthens the protection of individuals' rights while supporting inclusive mobility research.

- **Result 3:** Creation of annexed templates and compliance tools

The deliverable provides templates for informed consent, privacy statements, and stakeholder engagement documentation. It also outlines AI-specific compliance measures for data tools. These tools are significant as they offer ready-to-use resources for pilots and ensure harmonization of practices across project sites.

- **Result 4:** Mapping of Existing Data Sources and Legacy Systems

The deliverable includes a preliminary assessment of existing data repositories, legacy systems, and third-party data streams available across project partners.

This mapping aims to:

- Facilitate interoperability with the MODALSHIFT federated data platform.
- Identify reusable datasets, formats, and metadata structures that align with FAIR principles.
- Support data integration efforts by informing data sharing protocols, standardization needs, and role-based access control mechanisms.

The findings from this deliverable provide a foundation for ethically responsible, legally compliant, and methodologically sound research within the MODALSHIFT project. The protocols for informed consent, stakeholder engagement, and personal data protection directly support pilot activities involving human participants, such as surveys, app-based tracking, and AI-supported analysis tools for mobility prediction and optimization. These frameworks ensure that vulnerable populations are engaged with care, while simultaneously enabling the project to gather high-quality, usable data to support modal shift strategies. For stakeholders such as municipalities, logistics operators, and technology providers these guidelines offer clear procedures to follow, thereby reducing uncertainty and improving trust among participants.

The results presented in this deliverable have important implications for policymakers, particularly at the EU and national levels. The standardized data protection protocols, informed consent procedures, and ethical safeguards outlined here can serve as a model for urban and regional authorities aiming to implement mobility interventions that involve citizen data collection and digital tools. By ensuring GDPR compliance, equity in stakeholder participation, and privacy-by-design approaches, these findings support the Mission Soil objectives related to governance, citizen engagement, and digital soil monitoring. While the results are not directly tied to soil restoration, they enhance the governance and data management frameworks required to implement large-scale, cross-sectoral missions. Policymakers are encouraged to consider adopting similar ethical and privacy standards for future smart mobility and environmental data collection initiatives.

This deliverable provides a foundational framework for ethical data management within the MODALSHIFT project, outlining critical guidelines for data collection, privacy protection, and stakeholder engagement across pilot sites. Its significance lies in establishing trust and legal compliance for research involving human participants, particularly in sensitive mobility contexts. The protocols and tools presented will guide future data-driven activities in the project and ensure alignment with EU regulations and societal expectations. Moving forward, these guidelines will be refined and expanded as more pilot data becomes available, contributing to the project's success in demonstrating responsible innovation in smart and sustainable mobility solutions.



3 ABBREVIATIONS

Table 1: list of abbreviations

| Abbreviation | Definition |
|--------------|---|
| Abbreviation | Definition |
| DMP | Data Management Plan |
| GDPR | General Data Protection Regulation |
| AI | Artificial Intelligence |
| KPI | Key Performance Indicator |
| WP | Work Package |
| SME | Small And Medium-Sized Enterprise |
| EU | European Union |
| CSV | Comma-Separated Values |
| PDF | Portable Document Format |
| EEB | Ethics Executive Board |
| MDS | Mobility Data Space |
| DOIs | Digital Object Identifiers |
| SCCs | Standard Contractual Clauses |
| MGA | Model Grant Agreement |
| EMDS | European Mobility Data Space |
| DTLF | Digital Transport and Logistics Forum |
| NGSI-LD | Next Generation Service Interface - Linked Data |
| DPIA | Data Protection Impact Assessment |
| EBSI | European Blockchain Services Infrastructure |
| ORE | Open Research Europe |
| GPS | IGlobal Positioning System |



4 INTRODUCTION

The purpose of this Data Management Plan (DMP) is to outline the strategy and procedures for handling data throughout the MODALSHIFT project. MODALSHIFT aims to foster a modal shift towards more sustainable transportation modes through innovative services, data-driven decision-making, and cross-sector collaboration. As the project involves the collection, processing, and exchange of diverse data types including transport operations, logistics flows, passenger mobility, and sensor-based tracking the responsible and secure management of these datasets is central to the project's success.

This deliverable defines the principles, roles, tools, and governance mechanisms to ensure data is collected, stored, processed, and shared in a way that is compliant with relevant European regulations such as the General Data Protection Regulation (GDPR), and aligns with the FAIR principles (Findable, Accessible, Interoperable, Reusable). Particular attention is paid to data anonymisation, the use of trusted data sharing infrastructures, and the implementation of access control mechanisms, especially in the context of the project's digital twin systems and multimodal logistics services.

The DMP is structured to address the specific needs of the three pilot cases implemented in Spain, Italy, and Bulgaria, each with distinct data sources, stakeholder ecosystems, and technical setups. It also outlines long-term data preservation strategies, responsibilities for data stewardship, and periodic review procedures to ensure ongoing compliance and alignment with technological developments throughout the project lifecycle.

4.1 DELIVERABLE OBJECTIVE AND STRUCTURE

This deliverable presents the first version of the MODALSHIFT Data Management Plan. The objective of this DMP is to ensure that the data generated within the MODALSHIFT project is collected, handled, preserved, and shared in a secure, ethical, and transparent way. The plan establishes foundational principles for data management across all pilot cases and project activities, promoting responsible use and potential reuse in accordance with FAIR principles and GDPR. At this stage, the DMP provides an initial framework to guide partners in setting up local and cross-border data handling procedures while supporting technical integration into federated data spaces.

This first version of the DMP is considered a preliminary document that outlines the key elements of data management within the project. While it does not yet contain the full details of all data flows, datasets, or specific formats, it introduces the procedures, tools, and governance structures that will be applied. As the project progresses and the pilot activities in the three pilot cases (Spain, Italy, Bulgaria) mature, the DMP will be periodically updated to reflect evolving needs, more accurate information, and refinements in technical deployment. Planned updates will be delivered in M18 and M36 to ensure that all new developments are captured and addressed.

The structure of this deliverable is organized to reflect the data lifecycle and the legal-ethical responsibilities underpinning the MODALSHIFT project. Chapters 1 to 4 introduce the project's context, rationale, and objectives, setting the stage for the data management framework. Chapter 5 forms the core of the Data Management Plan (DMP), detailing the data classification scheme, formats, FAIR data principles, security measures, sharing mechanisms, and preservation strategies. Chapter 6 addresses ethical oversight, with subsections covering personal data protection, AI-specific compliance, and activities involving non-EU entities. Chapter 7 links ethics to research practice, outlining how citizen engagement, pilot activities, and stakeholder interactions relate to data handling and governance. The document concludes with practical guidelines for human participation (Chapter 8), overall conclusions (Chapter 9), and a comprehensive Annex section (Chapter 11), which includes templates, summaries, and tools to support implementation, compliance, and future replication efforts.

4.2 BACKGROUND NOTES

The MODALSHIFT project is committed to following the ethical and legal principles laid out in Horizon Europe, specifically Article 19 of Regulation (EU) 2021/695 and Article 14 of the Model Grant Agreement (MGA). In line with Article 19, MODALSHIFT ensures that all research and innovation activities are conducted in accordance with



fundamental ethical principles and relevant legislation. Furthermore, as required by Article 14 of the MGA, MODALSHIFT pledges to uphold the highest ethical standards throughout the entire duration of the project. These principles include respect for human dignity, freedom, democracy, equality, the rule of law, and the rights of individuals, including the rights of vulnerable groups.

Aligned with the ethical framework of Horizon Europe, the MODALSHIFT consortium commits to safeguarding key rights and values during the development and deployment of its multimodal transport services, data analytics, and digital solutions. These include the principle of proportionality, the right to privacy, the protection of personal data, the right to physical and mental integrity, the principle of non-discrimination, and the obligation to protect the environment and public health. These principles are embedded in the project's design and will be closely monitored throughout the implementation of the three pilot cases in Spain, Italy, and Bulgaria.

The guidelines for ethics and privacy in MODALSHIFT have been prepared in compliance with applicable national and European regulations, building upon established best practices from previous EU-funded projects and research initiatives. The following documents serve as key references and background for the ethical and legal foundation of the project:

The Charter of Fundamental Rights of the European Union (2012/C 326/02)

Ethical principles of Horizon Europe (Article 19 - Regulation (EU) 2021/695)

The European Convention on Human Rights and its Protocol

The European Code of Conduct for Research Integrity (ALLEA, 2023 update)

The General Data Protection Regulation (GDPR) (Regulation (EU) 2016/679)

4.3 ETHICS COMMITTEE AND GOVERNANCE

A dedicated Ethics Committee has been established within the MODALSHIFT consortium to ensure rigorous oversight of data protection, privacy, and ethical compliance across all project activities. This committee is responsible for guiding and auditing data management practices, ensuring alignment with European legal frameworks, most notably the General Data Protection Regulation (GDPR 2016/679) as well as with project-specific responsibilities outlined in the Grant Agreement. The committee will also ensure that data collected and processed in the three pilot cases (Spain, Italy, and Bulgaria) respects both local and EU-level ethical standards, and that citizen participation, consent, and compensation procedures are implemented responsibly.

The committee plays a central role in maintaining the integrity and transparency of MODALSHIFT's data lifecycle. It will regularly audit the practices of partners, issue ethics clearance for data-related tasks, and promote harmonization of procedures across national contexts. The standards established by the committee include:

- A project-specific data protection and ethics policy.
- Technical and organizational security measures to prevent unauthorized access.
- Anonymization and pseudonymization protocols before data exchange or analysis.
- Informed consent procedures, especially where personal or sensitive data is collected.
- Justifications for any processing of non-anonymized personal data.
- Documentation of any data transfers between countries or external parties.

To operationalize these responsibilities, the committee has appointed a Data Protection Manager who oversees ethical compliance in all data-related processes, including those handled via Digital Twins and Data Spaces. In addition, each academic and technical partner involved in data collection or processing has nominated an Ethics Representative to ensure local compliance and communication with the central Ethics Committee.

An Ethics Executive Board (EEB), composed of representatives from key partners, serves as the operational body of the committee. The EEB is tasked with:



- Ensuring that all data management and processing respects international codes of ethics and sectoral standards.
- Reviewing and delivering this DMP and subsequent updates.
- Coordinating the implementation of FAIR data principles (Findable, Accessible, Interoperable, Reusable).
- Reporting any critical ethical issues to the Steering Committee and, when necessary, escalating them to the General Assembly.

The Ethics Committee will issue regular internal reports and maintain documentation of ethics audits and approvals, particularly in connection with pilot activities.

5 DATA MANAGEMENT PLAN

This chapter presents the data lifecycle approach adopted by the MODALSHIFT project for the collection, processing, protection, and sharing of data generated across its three pilot cases. The DMP complies with European regulations, including ethical considerations and GDPR, Regulation EU 2016/679, ensuring that all data handling respects the rights of individuals and the principles of responsible research and innovation. Where applicable, national regulations of each participating country will also be followed.

This chapter explains how MODALSHIFT will:

- Manage various categories of research, operational, and observational data both during and after the project lifecycle.
- Describe the types, formats, and sources of data to be collected, processed, or generated by each use case and technical component.
- Define how data will be exploited, made accessible, or shared for verification, replication, and/or reuse within and beyond the consortium.
- Apply suitable methodologies, standards, and tools for data structuring, quality assurance, and harmonisation across domains (e.g., transport, logistics, public mobility).
- Identify principles for managing sensitive data, including anonymisation and restricted access where required, and clarify procedures for open access publication of eligible datasets.
- Establish procedures for data preservation, including long-term storage, archival formats, and sustainability of key datasets after the project ends.
- Restrict partner access to only the data necessary for their specific roles, with governance mechanisms in place to define permissible actions (e.g., view, transform, share). All access permissions are logged and regularly audited to ensure accountability and prevent misuse.

MODALSHIFT places particular emphasis on enabling trust-by-design data exchange via federated data space connectors and digital twin infrastructures, and ensuring that stakeholders including public authorities, logistics operators, and vulnerable users have clear guidelines and protections in place when contributing or accessing project-related data.

5.1 DATA MANAGEMENT PROCESS

All MODALSHIFT partners involved in collecting, processing, or sharing data are required to follow to a common set of data management principles. These principles are designed to support transparency, security, interoperability, and compliance with legal and ethical obligations particularly where personal or sensitive data is involved. While some principles (e.g., data minimisation, purpose limitation) apply specifically to personal data,



all partners are encouraged to adopt these guidelines more broadly to ensure quality, accountability, and reusability of all data assets across the project lifecycle.

Each use case (Spain, Italy, Bulgaria) will implement these principles through a designated Data Steward, who will be responsible for documenting procedures and verifying compliance within their operational environment. Data controllers and processors within the consortium must be able to demonstrate that they have considered and applied the principles detailed below.

Table 2: MODALSHIFT Data Governance Principles and Compliance Measures

| Principle | Description |
|---|---|
| Transparency | MODALSHIFT must operate as a transparent and reliable ecosystem. This includes the ability to explain how data is collected, processed, protected, and shared even when data itself is not openly available. |
| Personal data minimisation and purpose limitation | Personal data will only be collected when strictly necessary for the project's objectives and processed solely for clearly defined purposes. Only data relevant to specific use case needs will be retained. |
| Accuracy | All data must be kept accurate and, where applicable, regularly updated. Incorrect or outdated data, correction should be prioritized. If deletion is necessary, the data should first be archived in a designated space, accompanied by documentation outlining the reason for inaccuracy (e.g., results of quality checks, provider explanation, or data analysis). |
| Data storage | Secure storage methods, including encrypted systems and disaster recovery plans, must be in place. Personal data must not be retained longer than necessary. |
| Findability | All data and metadata must be made easily findable using persistent identifiers (e.g., DOIs), rich metadata, and indexed in searchable repositories. This ensures data reuse and transparency across the research lifecycle in compliance with FAIR principles. |
| Traceability | For all personal data, MODALSHIFT must maintain records to trace its origin, processing history, storage location, and recipients. This is also relevant to AI systems using such data. |
| Use of secondary data | Partners must ensure they have legal rights to reuse any third-party or historical data. Secondary data use must be documented and compatible with the project's research and innovation goals or go through an anonymization process (which would make the data compatible with any secondary use). Alternatively, the use of anonymization can be considered to remove this compatibility constraint (anonymized data is not subject to GDPR requirements). |
| Use of AI | Data used in AI systems (e.g., for traffic predictions or behavior analysis) must be traceable, and records of how the data was selected and processed must be maintained throughout the project. Data should be managed by following rules of UE IA Act to ensure compliance with risks for AI providers and users |
| Ongoing review and quality control | Data strategies must include checks for quality, metadata completeness, integration with FAIR principles, access rights, anonymisation effectiveness, and overall data integrity. |

5.2 FAIR DATA AND DATA FORMATS



The data generated, collected, or processed within the MODALSHIFT project will comply with the FAIR principles Findable, Accessible, Interoperable, and Re-usable as outlined by the European Commission for digital research outputs. These principles apply not only to datasets but also to the metadata, models, and tools that support the project's digital twin systems, multimodal services, and logistics innovations. Implementing FAIR in MODALSHIFT also entails adopting appropriate technical infrastructures, governance models, and collaborative practices across all partners and pilot cases.

5.2.1 MAKING DATA FINDABLE, INCLUDING PROVISIONS FOR METADATA

All project partners will follow a shared data management framework to ensure that any data collected or generated in the pilot cases is systematically stored, documented, and made traceable through metadata. Each dataset will be accompanied by a structured description using standardised metadata formats aligned with the European Mobility Data Space (EMDS) and Digital Transport and Logistics Forum (DTLF) guidelines. Metadata will include key information such as data source, owner, format, access level, versioning, and licensing.

MODALSHIFT will leverage its data integration infrastructure based on FIWARE connectors, Next Generation Service Interface - Linked Data (NGSI-LD) APIs, and trusted data space nodes to register and store data assets in a structured and modular way. Datasets designated as open or reusable will be assigned Digital Object Identifiers (DOIs) when published through public repositories (e.g., Zenodo or institutional portals), while sensitive or internal datasets will be managed via access-controlled environments in each pilot site.

A dedicated Data Space Layered Architecture will be used for data ingestion, harmonisation, and access management. The architecture includes:

- Raw Layer – Stores original input data from sensors, operators, or platforms (e.g., GPS logs, IoT trackers, logistics events).
- Bronze Layer – Organises raw data into structured formats for traceability without altering original content
- Silver Layer – Applies standardisation, cleaning, and formatting to enable interoperability across tools and platforms.
- Gold Layer – Hosts enriched, aggregated, or anonymised datasets ready for analysis, visualization, or sharing.

For legal or ethical compliance, especially with GDPR, any personally identifiable or sensitive data must be anonymized by the data producer prior to entry into this layer. In cases where full anonymization is not possible, the data must bypass the raw layer and enter at a higher layer (e.g., Bronze or Silver) with appropriate safeguards.

This layered approach ensures that both data quality and data protection are preserved, while also facilitating role-based access and future reuse. All layers will be indexed and searchable through metadata tagging and semantic ontologies where applicable.

For data that cannot enter through the raw layer for legal (GDPR) or industrial reasons, the execution of anonymization processes at the source of data by the data provider can be considered. In such scenarios, the data entering the data lake will already be anonymized. When anonymization is required by law, data may bypass the Raw Layer and enter at bronze or silver level, depending on its readiness.

MODALSHIFT's commitment to FAIR also means that even non-open data (e.g., personal or commercial-sensitive datasets) will remain discoverable and accessible under clearly defined terms for validation or regulatory purposes, ensuring transparency without compromising privacy or IP rights.

5.3 DATA SECURITY

MODALSHIFT must ensure that all data processing activities are carried out with the highest possible level of security. All data gathered, processed, and shared within the project, whether technical, operational, or personal will be protected through appropriate technical and organizational safeguards. Consortium partners will



collectively ensure that the data exchanged between entities and stored in project infrastructures is protected against unauthorized access, loss, or misuse. Any data shared outside the consortium (e.g., for policy analysis or research replication) will first be anonymized or appropriately secured.

In practice, this means each use case and partner must conduct a risk-based security assessment to determine the necessary security measures based on the nature and volume of the data involved. Where sensitive personal data is processed, such as passenger movement, geolocation, or mobility app interactions, a Data Protection Impact Assessment (DPIA) will be performed. These assessments will be guided by GDPR requirements and national data protection laws applicable to Spain, Italy, and Bulgaria.

To ensure secure handling of data throughout its lifecycle, MODALSHIFT will:

- Apply end-to-end encryption for data in transit and at rest.
- Implement access controls and authentication mechanisms, including role-based permissions and tokenized access, particularly for digital twin platforms and the shared data space infrastructure.
- Enforce logging and auditing of data access and modifications.
- Use secure APIs and connectors (e.g., NGSI-LD, European Blockchain Services Infrastructure (EBSI)-compliant interfaces) for federated data exchange.
- Develop continuity and disaster recovery plans to prevent data loss.

The MODALSHIFT federated data space infrastructure, based on a layered architecture, will include inherent cloud-based protections such as encryption, secure token validation, and compartmentalization of user roles. This architecture will ensure that access to sensitive or strategic data is limited to authorized stakeholders, with traceability logs in place to monitor activity across the system.

In case of a personal data breach, the affected Data Controller, typically the pilot site operator (e.g. AVANZA, ADF, VARNA Municipality) must follow the breach notification procedures set out by the project and report the incident to the relevant supervisory authority, in line with Article 33 of the GDPR.

By integrating modern cybersecurity practices with the ethical and legal obligations of Horizon Europe, MODALSHIFT ensures that data is handled not only efficiently and interoperable but also responsibly and securely (Annex G).

5.3.1 DATA SECURITY STRATEGY

As part of MODALSHIFT's broader commitment to data protection and ethical research practices, a dedicated Data Security Strategy has been developed to ensure that all personal and non-personal data handled throughout the project lifecycle is protected against unauthorized access, misuse, and loss. This strategy aligns with the GDPR, national legal requirements in Spain, Italy, and Bulgaria, and the Horizon Europe cybersecurity guidelines.

The security strategy builds on the foundation outlined in Section 5.3 and introduces specific technical and organizational measures to safeguard data within the federated architecture of the project. It is intended to guide partners, pilot site operators, and technical providers in applying consistent, high-quality security protocols across local and shared infrastructures.

Key factors of the strategy include:

- Encryption protocols for data at rest and in transit.
- Access control and authentication mechanisms.
- Secure data exchange via compliant APIs and federated infrastructure.
- Audit trails and monitoring for traceability.

This proactive and layered approach ensures that data security is embedded across all project activities, from pilot deployment to cross-site data analysis, and aligns with ethical and legal obligations.



5.4 DATA SHARING AND DATA TRANSFER PRINCIPLES

In MODALSHIFT, data sharing and transfer are integral to the collaboration between technical partners, pilot site operators, and stakeholders working across different countries and pilot cases. To ensure security, consistency, and transparency in data flows, all data shared within the project will follow clearly defined protocols aligned with GDPR, FAIR principles, and internal data governance policies.

ITA, as the project coordinator and technical integrator, is responsible for managing the project's collaborative documentation and internal knowledge sharing environment. A secure SharePoint-based repository will be established for all partners to upload, access, and download non-sensitive project documents, including deliverables, reports, and templates.

In addition, technical partners such as IRTIC, NGS, and the pilot site leads (AVANZA, ADF, VARNA Municipality) will contribute to the establishment of a federated data space infrastructure. This infrastructure will be responsible for managing the real-time and historical datasets collected during pilot implementations, such as GPS traces, traffic counts, public transport data, and cargo-bike usage patterns.

Each use case will manage its local node of the data platform, which is expected to:

- Enable trusted and secure data sharing through standardized interfaces (NGSI-LD, REST APIs).
- Respect role-based access control, ensuring that sensitive or personal data is only accessible by authorized personnel.
- Apply anonymization and pseudonymization techniques where required before transferring personal or sensitive data to shared repositories.
- Maintain a data access log to ensure traceability and transparency of who accessed what data and when.

The federated structure of the MODALSHIFT data platform also enables selective and conditional sharing of data across pilots, depending on relevance and sensitivity. For example, anonymized mobility simulation outputs may be shared between pilots to support comparative studies, while raw personal data remains confined to its origin site.

Further technical details on data sharing workflows, security protocols, and platform access rights will be expanded in the next version of the DMP, following the deployment and operational testing of the data space components during WP3 and WP4 (starting from M6).

5.5 OPEN SCIENCE, CURATION, AND LONG-TERM PRESERVATION

MODALSHIFT partners are fully committed to the principles of Open Science, particularly in ensuring that scientific knowledge, research outputs, and data generated during the project are widely accessible and reusable. This includes peer-reviewed publications, public deliverables, scientific datasets, software tools, and simulation outputs. To maximize visibility, replicability, and social impact, MODALSHIFT will prioritize open access dissemination channels and follow FAIR principles in all open data-related activities.

The Open Research Europe (ORE) platform will be the preferred venue for scientific publications produced within the project. In parallel, MODALSHIFT will use Zenodo, a centralized open-access repository recommended by the European Commission (via Open AIRE), to host preprints, datasets, code, and other dissemination artefacts. For software outputs, collaborative and transparent repositories such as GitHub will be used where appropriate, with reference documentation and licenses clearly provided.



The MODALSHIFT consortium will also encourage early sharing of research results, either through open preprint services or by publishing summaries in project communication channels. Where journal policies restrict full open access, parallel repositories will be used to ensure compliance with the project’s open science obligations.

All data that is made publicly available will be accompanied by:

- Persistent identifiers (e.g., DOIs),
- Metadata following FAIR and EMDS standards,
- Licenses outlining access and reuse conditions,
- Information on data provenance and quality assurance.

To ensure proper data lifecycle management, partners will curate and preserve data beyond the project's end, especially those resources deemed relevant for replication, training, or policymaking. Data not published openly (e.g., due to sensitivity or IP constraints) will still be securely archived and, if applicable, made available upon request for verification under controlled access agreements.

Table 3: MODALSHIFT Implementation of Open Science Principles

| Open Science Principle | How MODALSHIFT will implement it |
|--|---|
| Early and Open Sharing of Results | <ol style="list-style-type: none">1. Raise awareness among researchers and technical partners.2. Use preprint sources and project communication for early release. |
| Research Output Management | <ol style="list-style-type: none">1. Develop version-controlled documentation for models and data.2. Archive outputs on Zenodo with persistent identifiers. |
| Providing Open Access to Dissemination Artefacts | <ol style="list-style-type: none">1. Favor ORE and open-access journals.2. Use GitHub for software artefacts.3. Publish metadata-rich datasets with licenses. |
| Stakeholder Involvement in Co-Creation | <ol style="list-style-type: none">1. Use co-creation methods in WP3 and WP4.2. Engage city stakeholders and operators in data-driven service development. |

5.6 MODALSHIFT DATA SUMMARY

MODALSHIFT will generate and collect multiple datasets throughout its implementation, particularly within the three pilot sites (Spain – Madrid, Italy – Trieste, and Bulgaria – Varna). At this early stage of the project, only a preliminary outline of expected datasets can be provided, as most data-related activities are still in the planning or initial setup phase. As such, this deliverable serves as a first iteration and will be updated in future versions (M18, M36) and finalized at project conclusion (M42), reflecting progress in data acquisition and platform deployment.

Both personal and non-personal data will be handled during the project. All processing will strictly adhere to ethical standards and applicable legislation (notably the GDPR and relevant national laws), as described in Chapters 3 and 5. Some data will originate from new collection activities (e.g., sensors, surveys, digital platforms), while other datasets may be reused or derived from existing sources (Annex A).

To help structure and track dataset management across work packages, a dataset coding system is applied using the format:

- DS.WP#.X – where # refers to the work package number and X is the progressive number of the dataset within that WP. To support dataset traceability and version control, each dataset may also include a suffix indicating its lifecycle stage or transformation status (e.g., raw, v2_cleaned, gold_final). This helps track modifications made as data progresses through the Raw, Bronze, Silver, and Gold layers of the data space.



Versioning logs will be maintained to document key alterations and ensure reproducibility. Each dataset will be documented and used the structure recommended in the EC’s “Funding & Tenders Portal” guidelines. Specifically, for each dataset the following questions will be answered:

- What is the purpose of the data collection/generation and how does it relate to project objectives?
- What types and formats of data will be collected/generated, and what is their origin?
- Will existing data be reused, and if so, how?
- Who are the intended users or beneficiaries of the data (data utility)?
- What is the nature of the data? (P: Personal, IS: Industrial Sensitive, N: Non-Personal Non-Sensitive). This classification determines whether anonymization, pseudonymization, or no special treatment is required.

Table 4: Overview of Dataset Contributions by MODALSHIFT Partners

| WP/Task/Milestone & Responsible Partner | Details of the Data (Type, Format & Standard if applicable) | Dataset ID | G / C / O | Used for Another Dataset? | Status |
|---|---|------------|-----------|---------------------------|--------|
| WP3, T3.2, Mx AVANZA (Spain) | Real-time passenger flow data (.csv) | DS3.1.1 | C | Y | NA |
| WP3, T3.4, Mx ADF (Italy) | Port logistics operations logs (.json) | DS3.2.1 | C | Y | NA |
| WP4, T4.1, Mx NGS (Bulgaria) | Cargo-bike GPS logs (.csv), SME delivery requests (.xls) | DS4.1.1 | G | Y | NA |
| WP2, T2.3, Mx OCTO | Survey data on modal shift incentives (.xlsx), user feedback (.pdf) | DS2.3.1 | G | Y | NA |

Key:

- G = Generated; C = Collected; O = Open Data
- Status: NA = Not Available; COMP = Completed; NACOMP = Not Applicable
- For each dataset, the file format should indicate whether a recognized standard (e.g., GTFS, NETEX for public transport) is used. If no standard applies, please specify "none".
- Dataset IDs follow the structure DS.WP#.X, where WP# refers to the related work package and X is the dataset number within that WP. The listing order does not reflect dataset hierarchy."
- Y = Yes, this dataset is used in the processing or derivation of another dataset (e.g., in Bronze, Silver, or Gold layers).

This structure ensures consistency across partner contributions and helps track data handling procedures at both operational and governance levels. It also supports traceability for the ethics committee, data stewards, and stakeholders engaging with MODALSHIFT’s research outputs. Technical partners are expected to integrate datasets using the MODALSHIFT Data Space infrastructure rather than manual file transfer (e.g., via CSV or XLS), unless justified by project constraints.



Table 5: Partner-Level Overview of Data Types and Personal Data Use in MODALSHIFT

| No. | Organisation | Type of Data (Non-personal) | Personal Data |
|-----|--------------------|---|--|
| B1 | AVANZA (Spain) | GPS traces, passenger volume, route schedules, e-subsidy app logs | App-based travel behavior, mobility card data, consent forms |
| B2 | ADF (Italy) | Train and vessel timetables, port operation logs, CO ₂ emissions reports | None |
| B3 | VARNA Municipality | Cargo-bike trip data, locker usage, delivery traffic flow data | BLE sensor location traces (volunteer-based) |
| B4 | NGS (Italy) | Smart box and locker access logs | Pseudonymised device IDs |
| B5 | ITA (Spain) | simulation scenarios, use case KPIs | Survey responses with optional demographics |

*This table is a work in progress and will be updated as project data evolves

5.7 DATASET INTERLINKAGES AND REUSE ACROSS WORK PACKAGES

MODALSHIFT will generate and collect multiple datasets throughout its implementation, particularly within the three pilot sites (Madrid, Trieste, and Varna). These datasets, both personal and non-personal, span various domains such as passenger flows, logistics operations, digital platform use, and survey responses. While data acquisition is still in early stages, a cross-WP strategy has already been put in place to ensure that data flows are aligned with the project's reuse objectives and comply with ethical, legal, and technical safeguards.

To structure this, a unique dataset ID format (WP1) is used, which enables traceability and promotes interoperability. Several datasets are expected to serve multiple analytical purposes across different WPs. For instance, user tracking data collected in WP3 will be used for behavior modeling in WP4, while survey instruments from WP2 support both modal shift forecasting and evaluation metrics in WP5. Reuse is tracked through structured metadata and dataset inventory tables, ensuring proper documentation, consistency, and transparency. This mechanism ensures that research outputs are not siloed within individual WPs but rather contributes to the broader integration goals of the MODALSHIFT project.

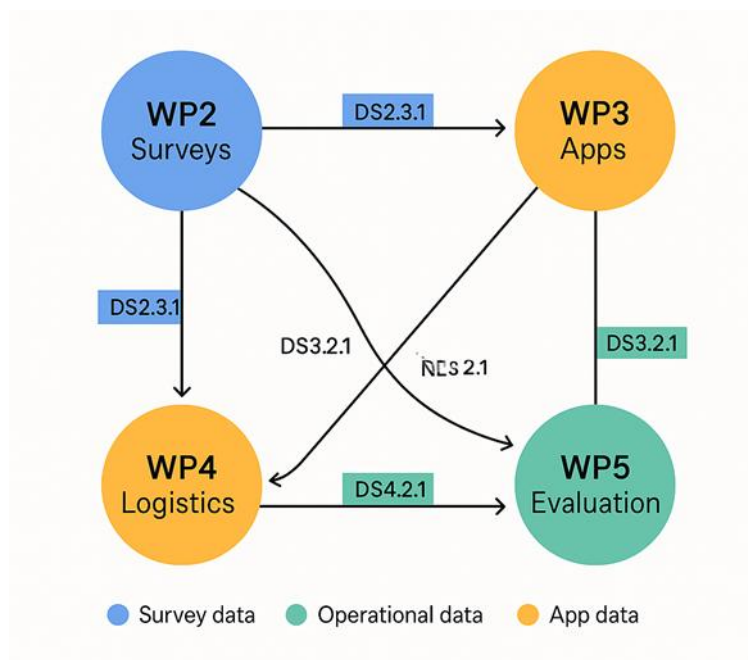


Figure 1: Dataset interlinkage and reuse across work packages

6 ADDRESSING ETHICS AND PRIVACY REVIEW

MODALSHIFT has undergone an initial ethics and privacy assessment during the proposal phase. Based on the outcomes of the Ethics Self-Assessment and the internal Ethics Committee setup, the project has received preliminary clearance to proceed with activities involving data collection, processing, and stakeholder participation, under the condition that all applicable ethical safeguards are implemented throughout the project duration.

Table 6: Overview of Ethics Requirements and Identified Issues in MODALSHIFT

| Ethics Section | Identified Issues |
|-------------------------------------|--|
| Section 2 – Humans | Engagement of citizens and stakeholders in surveys, interviews, and co-creation events |
| Section 4 – Personal Data | Processing of mobility-related personal data (e.g., GPS logs, BLE tracking, user surveys) |
| Section 6 – Non-EU Countries | Collaboration or data flows involving technical platforms hosted in non-EU territories |
| Section 8 – Artificial Intelligence | Use of AI algorithms in digital twins and behavioural prediction models involving sensitive datasets |

MODALSHIFT commits to monitoring and updating its ethics compliance measures in line with this guidance. The Ethics Committee and Ethics Executive Board (EEB) will lead this process, ensuring that relevant safeguards, policies, and corrective actions are implemented and reviewed regularly. Focus will be placed on the following areas:

- Ensuring that informed consent is obtained and documented for all human participation (e.g., surveys).
- Maintaining GDPR compliance and robust data anonymization methods in all pilot cases involving personal data.



- Evaluating the use of AI algorithms for fairness, bias mitigation, and transparency.
- Managing any data transfers involving non-EU territories in accordance with European data protection regulations (e.g., adequacy of decisions).

The Ethics Committee will provide periodic updates and formal reports as required, especially in coordination with future versions of this DMP and the outcomes of pilot deployment activities.

6.1 ETHICS SELF-ANALYSIS

The four ethics-related issues identified in the MODALSHIFT Ethics Self-Assessment namely those pertaining to humans, personal data, non-EU data flows, and the use of AI are further addressed in the following sub-sections. This self-analysis follows the guidance outlined in the European Commission's Ethics Self-Assessment Guide and serves to clarify how MODALSHIFT ensures ethical compliance across its research and innovation activities (Annex B).

6.1.1 PERTAINING TO HUMANS

MODALSHIFT involves the participation of human subjects, primarily through:

- Voluntary engagement in non-medical studies such as interviews, co-creation workshops, surveys, and behavioural feedback activities.
- Participants will not include:
 - Healthy volunteers for medical/clinical studies.
 - Patients participating in health-related interventions.

Due to the nature of MODALSHIFT's pilot activities especially in the areas of urban mobility, accessibility, and digital incentive systems some potentially vulnerable individuals or groups may be involved, including elderly users, low-income individuals, or persons with mobility limitations. Participation from these groups is crucial to the co-design and validation of more inclusive mobility services. Ethical safeguards and informed consent protocols are in place and described in more detail in Chapter 7.

6.1.2 PERTAINING TO PERSONAL DATA

MODALSHIFT involves the processing of personal data, including:

- GPS traces from mobile applications.
- Public transport card usage logs.
- Survey responses with optional demographic details.

However:

- MODALSHIFT does not process special categories of personal data, such as biometric, health, political, religious, or genetic information.
- The project does not conduct profiling, large-scale monitoring, or employ intrusive methods such as covert surveillance or automated decision-making.
- No further processing of previously collected personal data or merging external datasets is planned without ethical clearance.
- The project does not export personal data from the EU to non-EU countries.



That said, importing anonymized or aggregated personal data from outside the EU may occur. For example, sensor or app data collected locally in the Bulgarian or Italian pilots might be transferred to central EU-based analytics platforms for processing. All such transfers comply with GDPR and national legal requirements. MODALSHIFT does not process any personal data related to criminal records or offenses (Annex D).

6.1.3 PERTAINING TO NON-EU COUNTRIES

Some MODALSHIFT activities may involve data exchanges or institutional collaboration with non-EU countries, including partners operating infrastructure or analytical platforms. However, as of the first version of this DMP, MODALSHIFT does not involve the transfer of personal data to non-EU countries, nor are there pilot sites located outside the EU.

Nevertheless, the project is aware of potential ethical and legal considerations for data transfers originating from outside the EU and imported into EU-based processing environments (e.g., if any aggregated datasets or survey results are hosted by subcontractors based in non-EU countries). These scenarios, if they arise, will be reviewed by the Ethics Committee and handled according to the following principles:

Canada has received adequacy decisions from the European Commission, allowing limited data transfer under GDPR-compliant conditions.

For non-adequate countries, Standard Contractual Clauses (SCCs) or other legal safeguards will be applied as necessary.

No low- or lower-middle-income countries are involved in MODALSHIFT, and there are no plans to import or export biological materials, genetic data, or culturally sensitive resources.

The current version of the DMP confirms that:

- MODALSHIFT activities in non-EU countries do not raise major ethical concerns.
- Any potential future data imports (e.g., open datasets or tools) will undergo ethics and legal screening.
- The data platform infrastructure is hosted entirely within the EU, ensuring GDPR-compliant storage and analysis.

Further clarification and updates on cross-border data flows will be provided in the next DMP update (M18), particularly if additional subcontractors or replication activities are added.

6.1.4 PERTAINING TO ARTIFICIAL INTELLIGENCE (AI)

MODALSHIFT leverages AI in several technical components, including predictive modeling, digital twin simulations, and behavior analytics tools designed to support sustainable mobility and logistics. These AI systems are used in non-invasive, post-processed contexts where human oversight remains central. In accordance with the EU AI Act and the European Commission's High-Level Expert Group on AI guidelines, MODALSHIFT adopts a risk-aware and ethics-by-design approach. In terms of Artificial Intelligence, the use of observation tools (e.g., video-based traffic monitoring) requires adherence to the EU AI Act and applicable national data protection laws (such as Austria's Data Protection Act). Processing of sensitive imagery is restricted to authorized, confidential procedures with encryption and automated anonymisation (e.g., blurring of faces and personal identifiers). This ensures that individuals cannot be identified and that ethical standards such as fairness, human agency, and non-discrimination are maintained.

Key AI pilot cases include:

- Data-driven forecasting of traffic and modal shift patterns using historical and real-time data.
- Demand prediction for logistics and public transport services.
- Optimization of routing and travel-time estimation algorithms.



- Agent Based simulation

While these AI applications do not directly interact with users in real time, MODALSHIFT ensures the following safeguards:

- **Transparency:** All models, training data, and assumptions will be documented and made available for review.
- **Data Governance:** Where required and technically feasible, AI systems will use anonymized or pseudonymized datasets for training instead of no identifiable personal data.
- **Oversight:** AI-generated outputs will always be reviewed by human experts before decision-making or publication.
- **Non-discrimination:** Training data will be audited to minimize biases, and inclusive mobility indicators will be monitored for fairness.
- **Accountability:** AI performance will be benchmarked and validated, with clear documentation of limitations, caveats, and expected outcomes.
- **Societal Benefit:** AI tools are designed to contribute to sustainable urban mobility and equitable access, supporting the broader goals of the European Green Deal and Sustainable Development Goals (SDGs).

As MODALSHIFT's AI models do not involve biometric tracking, facial recognition, or autonomous decision-making that directly affects individuals, they are not considered high-risk AI systems. Nonetheless, the Ethics Committee will continuously monitor their development and deployment, and a formal AI Ethics Review will be included in upcoming DMP updates and WP5 evaluations (Annex G).

7 ETHICS AND PRIVACY-RELATED ACTIVITIES IN MODALSHIFT

This chapter outlines the research activities within MODALSHIFT and explores how these activities relate to data management, privacy, confidentiality, and ethical compliance. It provides an overview of pilot site protocols in each of the three pilot cases and concludes with a description of stakeholder engagement measures and ethics oversight in the project.

7.1 RESEARCH ACTIVITIES

Ethical and privacy-related considerations are integral to all MODALSHIFT research activities, particularly during the active pilot and co-creation phases (M6 to M30). The project involves a variety of data collection and citizen-engagement actions, including:

- Quantitative and qualitative surveys
- Workshops and focus groups with users and transport stakeholders
- Travel behavior analysis using anonymized and/or partial datasets
- Stakeholder interviews
- Feedback-gathering tools embedded in digital platforms

These activities take place across the project's three pilot cities (Madrid, Trieste, and Varna) and are conducted both in person and online using a suite of collaborative and analytical tools (e.g., online survey platforms, mobile applications, and simulation dashboards).

From the outset, MODALSHIFT integrated ethics and privacy tools into the project structure to monitor and safeguard research activities. A two-part Ethics and Privacy Questionnaire was developed and distributed among:

- **Pilot site partners** (AVANZA, ADF, VARNA Municipality)



- **Research and data processing partners** (e.g., ITA, NGS)

This approach allowed the project to tailor data governance and privacy practices to each partner's role and national context. Research partners were asked to detail:

- The methodologies used for data collection
- The tools or platforms employed
- Existing or planned privacy instruments (e.g., consent forms, information sheets)

City partners, on the other hand, provided input on:

- Local privacy expectations and legal constraints
- Engagement of vulnerable users and inclusion strategies
- Observations on ethical considerations from experience

Feedback from the questionnaire informed us of the development of a unified Privacy and Ethics Protocol guiding all data collection and stakeholder interaction activities before the launch of the pilots. The piloting phase is scheduled from M9 (March 2026) and will continue through M24 (mid-2026).

Particular attention is given to research involving vulnerable groups, as identified in the Ethics Self-Assessment (see Chapter 6). These groups include:

- **Elderly persons**, individuals with mobility limitations
- **Children and minors**, particularly in Varna and Madrid near schools or public transport hubs
- **People with cognitive or communication difficulties**

Protocols for these groups require the use of accessible, inclusive consent forms, support from guardians or tutors where necessary, and the incorporation of inclusive language. Furthermore, children's participation will be conducted under strict guidelines that prioritize their safety, dignity, and the principle of listening to their voices as users of transport systems and will only take place under the supervision of a legal representative (e.g., a parent or guardian).

Finally, observation and internal supervision of ethics and privacy measures are supported by cross-partner collaboration. Ethics committee members and coordination partners (e.g., ITA) are actively involved in meetings, audits, and documentation reviews to ensure all activities comply with ethical standards and legal frameworks (Annex E).

7.2 PILOT SITE PROTOCOLS

The pilots in Madrid (ES), Trieste (IT), and Varna (BG) represent the core environments in which MODALSHIFT's innovations are co-developed, tested, and evaluated. These urban pilots engage a diverse range of citizens, mobility service providers, and local authorities, making it essential to ensure that all interactions are guided by ethical practices and that participants' rights, safety, and privacy are always respected.

Each pilot site is responsible for:

- Identifying target groups (e.g., public transport users).
- Conduct data collection using both digital and physical tools.
- Managing local stakeholder engagement activities.
- Complying with national and EU data protection laws.

Given that the pilots may involve minors, elderly individuals, or people in socioeconomically or physically vulnerable situations, MODALSHIFT emphasizes inclusivity, non-discrimination, and clear informed consent procedures. These principles are embedded across all research activities, supported by tailored ethical protocols.



Feedback gathered during internal project workshops and through the Ethics and Privacy Questionnaire led to the adoption of site-specific pilot ethical protocols, which address:

- Informed consent forms tailored to each demographic group (including minors and vulnerable persons).
- Privacy notices with clear explanations of data usage, storage, and protection.
- Confidentiality procedures to anonymize or pseudonymize data collected during interactions.
- Adaptations in language, tone, and format of communication to ensure clarity and accessibility.

Each pilot case maintains its own local data protection contact point to coordinate with the project's Data Protection Officer and Ethics Committee. This ensures alignment with the GDPR and country-specific legal frameworks.

Inclusive participation is also a guiding principle in stakeholder co-creation workshops. All protocols are regularly updated to reflect ethical concerns raised during ongoing research and engagement. The Ethics Committee will monitor adherence to these pilot protocols throughout the project and propose updates where needed.

7.3 ETHICS AND PRIVACY INSTRUMENTS

In the context of the MODALSHIFT pilot cases, several research and data collection activities are conducted to evaluate mobility behavior, policy effectiveness, and modal shift incentives. These activities involve the collection of a wide range of data, including personal and behavioral information, and thus require robust ethics and privacy safeguards (Annex C).

The primary instruments used across the pilot sites include:

- **Quantitative surveys** (administered online or in-person):
Used by all city and research partners to gather data on mobility habits, perceptions of services, barriers to sustainable travel, and demographic profiles.
- **Workshops and focus groups:**
Engage specific user groups (e.g., public transport users) and stakeholders (e.g., city planners, operators) to co-design solutions and explore behavioral insights.
- **Qualitative interviews:**
Conducted with selected individuals from key demographic or stakeholder groups to explore perceptions, motivations, and acceptance of mobility innovations in greater depth.
- **Stated Preference experiments:**
Designed to model how users would respond to different mobility scenarios, service improvements, or policy incentives.
- **GPS tracking data collection:**
Voluntary, app-based tracking of individual journeys to study real-world behavior change, origin-destination patterns, and mode choice under new mobility interventions.

These activities are governed by specific Ethics and Privacy instruments, including but not limited to:

- **Informed Consent Forms** tailored to the activity, explaining the purpose of data collection, how data will be used, participant rights, and data retention policies.
- **Privacy Notices** detailing the nature of data collected (e.g., GPS traces, contact details), who will access it, where it will be stored, and the applicable legal frameworks (e.g., GDPR).



- **Information Sheets** summarizing ethical safeguards in accessible language, particularly for minors, elderly, or people with cognitive challenges.
- **Data protection protocols** include anonymization and pseudonymization measures, encryption practices, and user access controls based on role and sensitivity level.

Table 7 presents a breakdown of data collection methods per pilot site, including:

- Activity type (survey, interview, etc.)
- Target groups involved
- Sensitivity of data collected (low, medium, high)
- Ethical measures applied (informed consent, anonymization, etc.)
- Data storage/processing tools used

These instruments are continuously reviewed and updated in coordination with the MODALSHIFT Ethics Committee to ensure compliance with legal obligations and to maintain trust and transparency with participants across all pilot activities.

Table 7: Overview of Pilot Case Data Collection and Sensitivity Levels in MODALSHIFT

| Pilot case | Pilot measure | Target group(s) | Data collection activity | Level of sensitivity |
|--------------------|---|---|---|---|
| Pilot case | Pilot measure | Target group(s) | Data collection activity | Level of sensitivity |
| AVANZA (Spain) | Promoting modal shift from car to public transport via integrated digital tools and incentives | Public transport users, car commuters, transport authorities | Quantitative surveys, digital tool usage tracking, interviews | Medium to High (involves geolocation and user behavior) |
| ADF (Italy border) | Improving modal shift in logistics via real-time data exchange and coordination between rail and road | Freight operators, shunting terminal managers, regional logistics authorities | Operational data logs, stakeholder interviews, system performance metrics | Medium (mainly operational, some personal data) |

7.4 PROTOCOLS ON ETHICS AND DATA PROTECTION IN PILOT SITES

This section outlines the protocols and practices regarding ethics and data protection applied across the MODALSHIFT pilot sites. These sites represent diverse real-world contexts, including public transport operations, municipal mobility strategies, and freight logistics environments. Research and data collection activities are conducted under applicable European data protection regulations such as the General Data Protection Regulation (GDPR), as well as relevant national legislation in countries including Bulgaria, Italy, and Spain.

Pilot sites operating in non-EU countries, such as Canada, observe to their own national data protection frameworks, which are aligned or partially compatible with European standards.

All research activities in the project, including surveys, stakeholder consultations, workshops, and technology testing, are governed by ethics and privacy protocols developed by each participating organization. Some partners have internal ethics committees overseeing research procedures, including the implementation of informed consent, confidentiality measures, and responsible data storage practices. Other partners are currently in the process of developing institutional protocols or adapting them to the requirements of the project.

Digital tools and platforms are used throughout pilot activities for communication, data collection, and analysis. These tools include survey software, mobile tracking applications, online collaboration platforms, and video conferencing tools. When personal data is collected through applications (e.g., geolocation, travel behavior),



responsibility for ensuring data protection and compliance lies with the data processor or system operator. In cases where personal data is stored locally, it is kept in encrypted formats or secure storage solutions, and access is restricted to authorized personnel only.

The project ensures that all participants in research activities are properly informed about the use of their data. Informed consent is obtained prior to participation, and privacy notices are provided that explain the purpose, scope, and handling of collected data. These practices aim to safeguard participant rights, ensure transparency, and build trust in the project's mobility transformation initiatives (Annex D).

7.5 ADDITIONAL CONSIDERATIONS ON ETHICS AND PRIVACY IN PILOT ACTIVITIES

In addition to the standard protocols for data protection and ethical compliance, the MODALSHIFT project has identified several contextual factors that influence the implementation of ethics and privacy standards across pilot activities. These considerations stem from early stakeholder consultations and internal feedback mechanisms and are being integrated into the broader data governance and communication strategy.

Translation and Inclusive Language:

As discussed during WP1 activities on stakeholder identification and further reinforced in the Communication and Dissemination Strategy, challenges were identified regarding accessibility and inclusivity in multilingual environments. Specifically, concerns were raised about the need to translate project materials including consent forms, surveys, and informational documents from English into local languages used in each pilot site. This process must also ensure that inclusive protocols are maintained during translation, including the consistent use of gender-neutral language and culturally sensitive terminology. To address this, each pilot site is encouraged to review translations for clarity, inclusiveness, and legal appropriateness before dissemination to participants.

Role of the Ethics Committee and Clarification Needs:

Feedback collected through project surveys and internal communications indicated some uncertainty among partners regarding their responsibilities in relation to ethical oversight, particularly whether their activities require formal approval from an ethics committee and how to proceed if so. To clarify this, a central Ethics Committee is being consulted to oversee compliance with legal, procedural, and institutional ethics standards across all countries involved. The committee will not only conduct periodic audits but also serve as an advisory body. City and research partners are encouraged to seek guidance from the committee when facing ethical or privacy-related dilemmas during implementation, especially in cases involving vulnerable populations or personal data collection.

These considerations highlight the importance of maintaining ethical coherence across all project activities, regardless of local differences in language, legal requirements, or institutional practices.

7.6 STAKEHOLDER ENGAGEMENT

Stakeholder engagement is a central component of the MODALSHIFT project, designed to ensure that pilot mobility interventions reflect the needs and expectations of real users across diverse urban, peri-urban, and industrial contexts. The project prioritizes an inclusive, co-creative approach that incorporates insights from public, private, and civil society stakeholders across the pilot cases.

To achieve this, dedicated activities within WP1 have been carried out to capture the broadest possible spectrum of views and priorities. These activities guide project partners in developing effective outreach strategies, co-design sessions, and participatory data collection efforts, as described in D1.1.

Who Are the Stakeholders?

In MODALSHIFT, a stakeholder is defined as any individual, group, or organization that is affected by or can influence the design and implementation of the project. Stakeholders include:



- Public sector actors: city, regional, and national authorities (e.g., transport, urban planning, environment, education).
- Mobility and logistics operators (e.g., rail freight companies, bus or public transport operators, intermodal logistics terminals).
- Representatives of civil society: cycling/pedestrian associations, accessibility groups, local resident associations.
- Business actors: SMEs, retailers, and service providers related to urban freight and mobility.
- Research and innovation stakeholders, including universities and technology providers.
- Target Groups in the General Public

Special attention is given to those most impacted by modal shift strategies and mobility planning decisions, including:

- Commuters, including both freight and passenger flows.
- Children and youth in school areas.
- Seniors and persons with reduced mobility.
- Delivery workers, logistics operators, and last-mile service providers.
- Citizens in neighbourhoods undergoing significant traffic or infrastructure changes.
-

Stakeholder Mapping and Early Engagement

The stakeholder identification process was launched at the project's Kick-off Meeting via an interactive mapping session involving all pilot site representatives. The session was designed to identify key local actors, their interests and concerns, and their potential role in supporting pilot deployment.

To deepen this work, a follow-up online workshop gathered updates from each pilot location on confirmed and potential stakeholder groups, including progress on outreach, co-creation sessions, and planned engagement methods.

Outreach Strategies and Tools

To foster meaningful participation, MODALSHIFT partners use both traditional and digital tools, including:

- Workshops and co-design labs with community representatives.
- Interviews and focus groups with logistics operators, planners, and public officials.
- Surveys and participatory mapping tools tailored to local contexts.
- Online communication platforms for continuous feedback (e.g., digital consultation boards, webinars).

The involvement of stakeholders is crucial to ensure buy-in at institutional, community, and operational levels, particularly when interventions require changes in traffic patterns, data sharing, or infrastructure redesign. Special engagement strategies are being implemented in cities where pilots are located near schools, freight hubs, or involve vulnerable user groups.

Inclusivity and Accessibility

Across all pilots, MODALSHIFT promotes an inclusive approach that seeks to remove barriers to participation. This includes using local languages in communication materials, designing child- and disability-friendly engagement



tools, and working with trusted community organizations to reach underrepresented voices. These measures are being coordinated in alignment with the project’s Communication and Dissemination Strategy.

Private Sector Participation

Private logistics providers, freight forwarders, and shared mobility operators are key allies in the transition to more sustainable transport. In several cases, such actors are being directly involved in data sharing, co-creating interventions, or supporting the piloting of digital services. Their engagement is vital for ensuring feasibility, replication, and scaling of results (Annex F).

Table 8: stakeholder and Public Target Groups Across Pilot Sites in MODALSHIFT

| Pilot site | Target groups among the public | Stakeholders among organisations (level of relevance/interest) |
|------------------|---|---|
| AVANZA (Spain) | Public transport users, Commuters, Elderly, Students | AVANZA Mobility Services - 5 Local Transport Authority - 5 Municipal Planning Dept. - 4 |
| ADF (Italy) | Freight operators, Train conductors, Port staff, Logistics coordinators | ADF Logistics - 5 National Railways - 5 Port Authority - 4 Customs Office - 3 |
| VARNA (Bulgaria) | City residents, Cyclists, Pedestrians, School children, Local SMEs | Municipality of Varna - 5 Cyclist Association - 4 Education Department - 4 Chamber of Commerce - 3 |

* (Scale: 5 = High relevance/interest, 3 = Medium, 1 = Low)

8 GUIDELINES FOR HUMAN PARTICIPATION

8.1 HUMAN RIGHTS

In MODALSHIFT, human participation is handled with strict adherence to ethical standards and human rights. No participant will be in a position of dependence on the research team, and no form of misinformation will be used. Participants will not be subjected to the influence of drugs, alcohol, or placebos, nor will they be asked to consume any food or drink related to the research. The project will not cause physical discomfort to participants.

Where data collection involves personally identifiable information, participants are informed beforehand, and their explicit consent is always required. Participation in the research is voluntary, and individuals can withdraw at any time without consequences.

MODALSHIFT involves different categories of human participants:

- Volunteers participating in travel behavior and stated preference surveys
- Passersby recorded by video devices such as AI-based mobility observation systems
- App users who install travel behavior tracking application
- Stakeholders involved in co-creation workshops or consultations

1. Volunteers Participating in Surveys



Project partners will distribute travel behavior and stated preference surveys to target populations in participating cities. The goal is to collect insights from a representative number of individuals in each site (e.g., 750 users per city). Participants are contacted through email, informed about the objectives and methods of the study, and provided with an informed consent form before participating.

2. Stakeholders in Co-creation Workshops

Stakeholders (e.g., local authorities, mobility service providers, interest groups) are invited to participate in workshops. Recruitment is conducted through established networks or public calls. Participants receive detailed information about the project and data use. Contact data is only shared with explicit permission.

These workshops are essential for shaping inclusive mobility policies and understanding practical concerns at the local level. Stakeholder input is handled confidentially and used strictly for project-related purposes (Annex C).

8.1.1 GENDER AND INCLUSION CONSIDERATIONS

MODALSHIFT is committed to promoting gender equality and inclusion across all project activities, in alignment with the Horizon Europe gender equality obligations and principles of Responsible Research and Innovation. The project seeks to ensure that no individual or group is disadvantaged or excluded based on gender, age, disability, ethnicity, or socioeconomic background.

- Gender Balance in Participation and Representation

All surveys, co-creation workshops, and interviews conducted within MODALSHIFT aim for balanced participation across gender and age groups. Recruitment strategies explicitly encourage the inclusion of women, underrepresented groups, and vulnerable populations such as the elderly and people with disabilities. Where applicable, gender-disaggregated data is collected and analyzed to inform inclusive mobility policies.

- Inclusive Design and Accessibility

Digital tools (e.g., mobility apps, platforms for engagement) developed or used in the project are subject to inclusive design reviews, ensuring accessibility for users with varying abilities and digital literacy levels. This includes compatibility with screen readers, simplified interfaces, and multilingual support when relevant.

- Gender-Sensitive Data Analysis

The data collected throughout the project whether behavioural, operational, or feedback-based is analysed with attention to gender-specific trends and impacts. This helps identify potential disparities in mobility patterns, access to services, or perception of transport safety. Insights from this analysis are used to formulate policy recommendations that support gender-inclusive modal shift strategies.

- Gender Equality Monitoring in the Consortium

MODALSHIFT monitors gender balance within its consortium, including representation in leadership roles, scientific contributions, and decision-making bodies. Partners are encouraged to adopt or align with Gender Equality Plans, in accordance with Horizon Europe requirements.

8.2 GOOD RESEARCH PRACTICES

MODALSHIFT is committed to ensuring safe and ethical conditions not only for research participants, but also for researchers and other stakeholders involved. All project activities will follow established standards of good research conduct. The following core ethical principles guide all data collection and stakeholder engagement processes:

- Respect for human dignity and integrity
- Honesty and transparency in all interactions with research participants



- Respect for individual autonomy, including securing free and informed consent
- Protection of vulnerable individuals and groups
- Ensuring privacy, confidentiality, and data security
- Promoting justice and inclusiveness
- Minimising harm while maximising potential benefits of participation and research outcomes

To uphold these principles, the project establishes a framework for ethics oversight, including partner coordination to monitor compliance with European and national legislation (e.g., GDPR, national privacy laws). Where required, research partners will consult or work through national or institutional Ethics Committees to review protocols before conducting activities involving human subjects or personal data.

MODALSHIFT also strives to promote inclusivity and equity by designing research activities in ways that reach underrepresented communities and ensure gender and demographic balance across the participating regions. This includes adapting materials and communication formats for accessibility, using inclusive language, and enabling participation from individuals with diverse mobility, cognitive, or social needs.

All project partners share the responsibility of upholding these good research practices, and any concerns or incidents related to ethics or participant safety are to be promptly addressed through the appropriate internal and institutional channels.

8.3 RECRUITMENT POLICY

The recruitment of human participants across the MODALSHIFT project is designed to ensure voluntary participation, data protection, and ethical compliance. The following subgroups are included in the recruitment strategy:

1. Volunteers Participating in Travel Behaviour and Stated Preference Surveys

Participants for the travel behaviour and stated preference surveys will be recruited through the existing networks of participating cities and stakeholder organisations. Additionally, the project may partner with a professional survey distribution company to ensure sufficient outreach and representativeness.

Contact details of potential participants will be managed securely and only shared on a need-to-know basis through a protected internal workspace (e.g., SharePoint or an equivalent secure platform), accessible only to authorised project members. A more detailed description of data handling and access control will be elaborated in future updates of the DMP.

2. Stakeholders in Co-Creation Workshops

Stakeholders and domain experts will primarily be recruited via the professional networks of the project partners, as well as through direct expressions of interest (e.g., subscriptions to newsletters, participation in workshops, or public engagement events)

Only stakeholders who have given their consent will have their contact information shared internally. Workshop invitations will be sent by the respective partner who has previously engaged with the stakeholder. Participants will be asked to sign an informed consent form prior to participation in any recorded or data-relevant activity.

- Targeted stakeholder groups include:
- City and regional authorities
- National government bodies
- Public transport operators
- Infrastructure managers
- Technology and logistics provider



- Civil society organisations
- Experts in urban mobility, sustainability, and transport policy

Stakeholder selection is based on:

- Their influence or expertise relevant to modal shift strategies
- Representation across sectors and roles to ensure comprehensive feedback and collaboration.

All communication with stakeholders will be clear and transparent about their rights, the objectives of the research, and their option to withdraw at any time (Annex H).



9 CONCLUSION

This first version of the MODALSHIFT Data Management Plan has laid the **groundwork** for secure, transparent, and ethical data handling across the project. It has defined common principles, governance structures, and compliance tools that ensure alignment with GDPR, FAIR standards, and Horizon Europe's ethical requirements. Early work has highlighted the importance of harmonizing data practices across diverse pilot sites, the value of ready-to-use instruments such as consent forms and privacy notices, and the need to pay particular attention to vulnerable groups and cross-border data transfer issues. Preliminary **mapping of datasets** and legacy systems has also revealed both opportunities for interoperability and challenges that will need careful alignment as the project advances.

In the next stages, the plan will be progressively updated to capture the growing maturity of the pilots and the technical infrastructures underpinning them. This will include more detailed dataset inventories, refined security protocols, and operationalized workflows for cross-site data sharing. The role of Ethics Committees, especially in local contexts, will be further clarified, and AI compliance measures will be adapted to remain consistent with the evolving EU AI Act. Continuous learning across pilot sites will be central to ensuring interoperability, replicability, and scalability of data practices, supporting both the project and broader European mobility initiatives.

General, **the findings** of this first version of the DMP provide a strategic orientation for decision-making in MODALSHIFT and beyond. They demonstrate how ethics-by-design and FAIR principles can be put into practice in multimodal transport research, offering a replicable model for policymakers, researchers, and operators. By moving from principles to practice, the DMP strengthens the project's ability to generate actionable insights, foster trust among stakeholders, and contribute to sustainable, inclusive, and citizen-focused mobility systems.



10 REFERENCES

1. European Commission, Horizon Europe Programme Guide, Version 2.0, 11 April 2022. Available at: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_en.pdf [Accessed 7 Oct. 2023].
2. European Parliament, Charter of Fundamental Rights of the European Union. Available at: https://www.europarl.europa.eu/charter/pdf/text_en.pdf [Accessed 7 Oct. 2023].
3. European Commission, Ethical Principles of Horizon Europe. Available at: https://ec.europa.eu/research/participants/data/ref/h2020/legal_basis/fp/h2020-eu-establact_en.pdf#page=11 [Accessed 7 Oct. 2023].
4. Council of Europe, European Convention on Human Rights. Available at: https://www.echr.coe.int/documents/d/echr/convention_ENG [Accessed 7 Oct. 2023].
5. ALLEA - All European Academies, The European Code of Conduct for Research Integrity, Revised Edition, 2023. Available at: <https://allea.org/wp-content/uploads/2023/06/European-Code-of-Conduct-Revised-Edition-2023.pdf> [Accessed 7 Oct. 2023].
6. European Union, General Data Protection Regulation (GDPR) (Regulation (EU) 2016/679). Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1528874672298&uri=CELEX:32016R0679> [Accessed 7 Oct. 2023].
7. Agencia Española de Protección de Datos (AEPD), Spain. Available at: <https://www.aepd.es/es> [Accessed 7 Oct. 2023].
8. Comissão Nacional de Proteção de Dados (CNPD), Portugal. Available at: <https://www.cnpd.pt> [Accessed 7 Oct. 2023].
9. Datenschutzbehörde – Austrian Data Protection Authority. Available at: <https://www.dsb.gv.at> [Accessed 7 Oct. 2023].
10. Commission Nationale de l'Informatique et des Libertés (CNIL), France. Available at: <https://www.cnil.fr> [Accessed 7 Oct. 2023].
11. Garante per la Protezione dei Dati Personali – Italy. Available at: <https://www.garanteprivacy.it> [Accessed 7 Oct. 2023].
12. Gegevensbeschermingsautoriteit – Belgian Data Protection Authority (GBA). Available at: <https://www.gegevensbeschermingsautoriteit.be> [Accessed 7 Oct. 2023].
13. Commission for Personal Data Protection (CPDP), Bulgaria. Available at: <https://www.cpdp.bg> [Accessed 7 Oct. 2023].
14. European Union. Regulation 2024/1689 of Artificial Intelligence Act (IA) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202401689



11 ANNEX(ES)

11.1.1 ANNEX A – DATASET OVERVIEW FOR MODALSHIFT

The annex describes a consolidated overview of datasets used in MODALSHIFT, their alignment with open science and ethical principles, and includes metadata such as type, reuse, and classification. It emphasizes traceability, accountability, and ethics, but doesn't yet clarify when consent vs anonymization applies. Each entry includes the corresponding Work Package (WP), Task, and responsible partner, the data type and format, its classification (Generated, Collected, or Open), its reuse status in other datasets, and its current completion status. This tracking mechanism supports reproducibility, accountability, and traceability in line with FAIR data principles and ethics governance.

This table summarizes datasets associated with specific tasks and milestones across MODALSHIFT partners. It helps assess the status and origin of each dataset (e.g., stakeholder surveys, app tracking, or logistics data), identifies which datasets are reused in other parts of the project, and ensures compliance with data lifecycle management and ethics requirements.

Table 9: Work Package Dataset Inventory and Reusability Tracking

| Work Package, Task, Milestone, and responsible beneficiary | Details of the data (type and format) | Dataset | G (Generated), C (Collected), O (Open Data) | Utilised for another dataset (Y/N) | Status (NA, COMP, NACOMP) |
|--|--|----------|---|------------------------------------|---------------------------|
| WP1 - T1.2, M1.1 - AIT | Stakeholder and user mapping data (Excel, PDF) | DS.WP1.1 | C | Y | COMP |
| WP2 - T2.1, M2.2 - TĀI | Stated preference survey data (CSV, SPSS) | DS.WP2.1 | C | Y | COMP |
| WP3 - T3.1, M3.1 - EPI | App tracking data (JSON, GPX) | DS.WP3.1 | C | Y | NACOMP |
| WP4 - T4.2, M4.2 - ADF | Logistics platform usage data (CSV, XLSX) | DS.WP4.2 | G | N | COMP |
| WP5 - T5.1, M5.1 - VARNA | Local transport operations data (Excel, PDF) | DS.WP5.1 | O | N | COMP |



11.1.2 ANNEX B – ETHICS SELF-ASSESSMENT SUMMARY

This annex provides an overview of the ethics self-assessment carried out within the MODALSHIFT project. It outlines key ethics issues identified during the planning and early implementation stages and summarizes the compliance measures put in place in line with applicable legal and ethical standards.

1. Ethics Issues Identified

The ethics review and self-assessment process identified the following key issues relevant to the project:

- Use of Human Participants.
- Volunteers may participate in surveys, interviews, or co-creation workshops. In some cases, vulnerable individuals such as children, elderly people, or people with reduced mobility may be involved.
- Personal Data Collection and Processing.
- Data collection activities involve personal data such as names, email addresses, location data, and mobility behavior. All processing activities must be submitted with the General Data Protection Regulation (GDPR)
- Non-EU Data Transfers.
- Project activities involve collaboration with partners in countries outside the EU (e.g., Canada). All data transfers to and from these regions are conducted under GDPR and respective national laws.
- Use of Artificial Intelligence.
- AI-based tools may be used on some pilot sites. These must comply with the EU AI Act and relevant principles on transparency, fairness, and data minimization.

2. Compliance Measures and Instruments

To address the issues above, the following measures are being implemented:

- Informed Consent Procedures.
- All participants are informed of their rights and the purpose of the data collected. Consent is collected prior to participation through digital or physical consent forms tailored to each data collection method and target group.
- Data Minimization and Anonymization.
- Only data strictly necessary for the research are collected. Personal identifiers are removed or pseudonymized where possible. Storage is secure using encryption protocols.
- Ethics Protocol Oversight.
- Project partners are required to ensure that research involving human subjects is approved by their respective institutional or national ethics committees where applicable. An internal ethics contact point is available to consult on open questions.
- Use of Digital Platforms.
- Tools used for data collection (e.g., surveys, tracking applications) are reviewed for data protection compliance. Participants are notified through signage, QR codes, and information sheets.

3. Summary of Status



Table 10: Overview of Identified Ethics Topics and Mitigation Measures in MODALSHIFT

| Ethics Topic | Identified | Mitigation Measures in Place | Responsible Entity |
|-------------------------------|------------|---|-------------------------|
| Human Participants | Yes | Informed consent, voluntary participation | Pilot cities, WP Leads |
| Personal Data (non-sensitive) | Yes | GDPR compliance, secure storage | Data controllers |
| Personal Data (sensitive) | No | Not applicable | – |
| Non-EU Data Transfer | Yes | Based on GDPR Art. local laws | Coordinator, Legal team |
| AI and Data Processing | Yes | Compliance with EU AI Act principles | Tech providers, WP5 |

This ethics self-assessment will be updated as the project evolves, and additional data collection activities are launched. The project remains committed to ensuring the highest ethical standards in all its research activities.

11.1.3 ANNEX C – INFORMED CONSENT FORM TEMPLATES

This annex includes standardized templates for informed consent, designed to be adapted and used by all MODALSHIFT project partners engaged in collecting data from human participants. These templates reflect legal and ethical obligations under the General Data Protection Regulation (GDPR) and best practices in responsible research.

Templates cover the three main participant interaction types in the project:

C.1. Consent Form for Survey Participation

- Title of Study: [Insert specific activity or survey title]
- Responsible Institution: [Insert Partner Name]
- Contact Person: [Insert Name, Email]
- Purpose of the Study:

You are invited to participate in a survey related to mobility behavior. The goal is to collect insights that help design better and more solutions.



Voluntary Participation:

Participation in this study is entirely voluntary. You may decline to answer any question and withdraw at any point without any negative consequence.

Data Collection and Use:

Your responses will be used for research and statistical purposes only. Any data will be anonymized prior to being used for any communication or publication.

Confidentiality and Data Protection:

Data will be handled according to EU GDPR standards. Only authorized personnel will access your data, which will be stored securely.

Contact for Questions:

For questions or complaints about the study or your rights as a participant, contact: [Insert contact info]

Consent Statement:

I confirm that I have read and understood the information provided.

I voluntarily agree to participate in this survey

Signature: _____ Date: _____

C.2. Consent Form for Workshop Participation

- Title of Workshop: [Insert name of workshop]
- Facilitator/Partner: [Insert name]

Purpose of the Workshop:

This workshop invites participants to provide feedback and ideas for improving solutions.

Participation Details:

Participation is voluntary and any comments shared may be recorded (audio/video/text). Your input will help shape the project's mobility actions

Data Handling:

Video/images used for dissemination purposes will require additional media consent. For managing consent and compliance related to media content lies with the individual partners producing or disseminating the material, in line with GDPR and project ethics protocols.

Confidentiality and Data Protection:

Your information will be securely stored and used only for the intended research purposes in accordance with GDPR.



Consent Statement:

- I agree to participate in this workshop and understand my rights regarding data privacy.
- I give permission for anonymized quotes or insights I provide to be used in project reporting.

Signature: _____ Date: _____

C.3. Consent Form for Use of Mobile App:

- App Name: [Insert application name]
- Controller: [Insert organization operating the app]

Purpose of the App:

This app collects travel behavior data to analyze patterns and support sustainable mobility planning. The collected data is later anonymized through secure backend processing (not directly on the user's device).

Type of Data Collected:

The app collects location data (GPS), timestamps, and usage frequency. No data is shared with third parties.

Your Rights:

You may uninstall the app and stop participating at any time. Data already collected will either be deleted or retained in an anonymized way for project purposes only

Data Storage:

Data is encrypted and stored on secure servers under GDPR compliance.

Consent Statement:

- I understand how my data will be used and give me consent to use the app for this study.
- I agree to share mobility data with the project for research use only.

Signature (if applicable): _____ Date: _____

These templates are to be adapted by each MODALSHIFT partner to reflect local language requirements and data collection specifics. Translations and culturally appropriate adaptations must also respect inclusive language and ethical standards.



11.1.4 ANNEX D – PRIVACY STATEMENT TEMPLATES

This annex provides sample privacy statements to be used in the MODALSHIFT project when collecting personal data from individuals, whether through surveys, workshops, tracking applications, or other research activities. These templates ensure transparency and compliance with EU GDPR (Regulation 2016/679) and relevant national frameworks. Privacy statements should accompany all participant facing tools or communications where personal or sensitive data is collected.

D.1. Privacy Statement for Surveys

Purpose of Data Collection:

We are collecting information about travel behavior to understand how to improve sustainable transport options in your area as part of the MODALSHIFT project.

Data Controller:

- [Insert organization name]
- [Insert contact email]

Legal Basis for Processing:

Data are collected based on your explicit consent. You may withdraw your consent at any time without consequences.

What We Collect?

- Sociodemographic information (age group, gender, occupation)
- Travel preferences and behavior
- Contact information (only if you agree for follow-up or prize draw)

How Your Data Will Be Used?

- Aggregated analysis and reporting within the MODALSHIFT project
- Shared only with project partners



- Never sold or used for commercial purpose

Data Retention:

Your data will be kept securely for the duration of the project (up to [insert year]) and deleted thereafter.

Your Rights:

- You have the right to:
- Access, correct, or delete your data
- Withdraw consent
- Lodging a complaint with a Data Protection Authority

Contact for Concerns:

- [Insert DPO or contact person name and email]

D.2. Privacy Statement for Workshops

As a participant in this MODALSHIFT co-creation workshop, we wish to inform you of the following:

- We may record the session (audio/video) or take notes for internal use
- Your participation is voluntary, and you can opt out at any time.
- Personal data such as your name, title, and institutional affiliation may be collected.
- Only anonymized or aggregated information will be used in publications.
- Your data will be handled in accordance with the GDPR and stored securely. Contact [Insert responsible partner name] if you have questions.

D.3. Privacy Statement for Mobile App Users

This application is part of the MODALSHIFT project and collects mobility data (such as GPS location, travel mode, and time) to help design sustainable transportation strategies.

- No identifiable personal information is collected without your consent.
- Your data is encrypted and stored on secure EU servers.
- You may uninstall the app at any time, and your data will stop being collected.
- Data is processed only by MODALSHIFT partners for research purposes.
- Full privacy policy and contact details are available in the app settings under “Privacy”.

General Guidance for Use:

- Privacy statements must be accessible, concise, and written in plain language.
- They should always be available before data collection begins.
- If translated, partners must ensure translations maintain legal clarity and inclusive language.



For additional support or review, templates may be validated by the project's Data Protection Officer or legal team prior to use.

11.1.5 ANNEX E – ETHICS AND PRIVACY QUESTIONNAIRE (CITY AND RESEARCH FORMS)

This annex includes the two-part internal questionnaire used within the MODALSHIFT project to gather essential information on ethics and privacy practices from participating partners. The goal is to harmonize practices, identify needs, and ensure compliance with ethical standards and data protection regulations across all pilot locations and organizations.

E.1. Questionnaire for City Partners

Purpose:

To assess how each city participating in MODALSHIFT handles ethical and privacy aspects during local activities such as pilot deployments, stakeholder engagement, and data collection involving citizens.

Section A: General Information

City name:

- Contact person and role:
- Name of local institution(s) involved in data collection

Section B: Ethics and Consent

- Have you obtained or do you plan to obtain ethics clearance from a local or national ethics committee?
- Will informed consent be collected from participants involved in workshops, surveys, or any pilot activities?
- What measures are in place to protect children or vulnerable populations in your pilot area?
- Will participant information be translated into your local language?

Section C: Data Management

- What types of data will you collect (e.g., survey responses, sensor data, GPS)?
- Will any personal data be collected (e.g., names, contact details, location)?
- How will personal data be stored and protected?
- Will any data be transferred to partners or outside of your country?

Section D: Inclusivity and Accessibility

- Have you identified any vulnerable or underrepresented groups for your activities?
- Are there any measures in place to ensure inclusiveness (e.g., translated materials, accessible formats)?



E.2. Questionnaire for Research and Data Collection Partners

Purpose:

To collect information on research protocols, data handling practices, and compliance with ethical standards among institutions managing technical and scientific activities in MODALSHIFT.

Section A: Institutional Information

- Organization name:
- Department/unit responsible for research:
- Contact person:

Section B: Ethical Protocols and Oversight

- Does your organization have an internal ethics committee?
- Has the committee reviewed MODALSHIFT activities under your responsibility?
- Are informed consent forms developed and in use?
- Do you conduct ethics training for researchers involved in data collection?

Section C: Data Collection and Tools

- What kind of data are you collecting (e.g., GPS, interviews, app usage, video)?
- What digital tools or platforms are used for data collection (e.g., Qualtrics, custom app)?
- Are any special categories of personal data involved (e.g., health, mobility disability)?

Section D: Privacy and Data Security

- How are you securing personal data (e.g., encryption, pseudonymization, anonymization)?
- How is data shared between partners?
- Do you have a data breach protocol in place

Section E: Compliance and Reporting

- Are you familiar with your obligations under GDPR and other relevant national laws?
- Do you require support from the MODALSHIFT Ethics Committee or DPO?



11.1.6 ANNEX F – STAKEHOLDER ENGAGEMENT WORKSHOP SUMMARY

This annex compiles the key outputs from stakeholder engagement activities conducted during the early phases of the MODALSHIFT project. These activities aimed to identify, involve, and understand the perspectives of relevant stakeholders from each pilot city and participate in the organization. The engagement process ensures that the mobility measures proposed are aligned with real needs, local conditions, and inclusive participation.

F.1. Initial Stakeholder Identification Workshop (Kick-off Phase)

- Date: June 2025
- Format: World Café-style interactive session
- Participants: Representatives from all pilot cities and partner organizations
- Facilitators: Project coordination team and WP1 leader

Main Objectives:

- Define key stakeholder groups per city
- Identify barriers and enablers for stakeholder involvement
- Explore outreach strategies for recruitment

Discussion Prompts:

- What strategies have you used to engage stakeholders for mobility-related projects?
- What challenges do you anticipate in involving key actors in MODALSHIFT?
- How can we ensure the participation of underrepresented and vulnerable groups?

Main Takeaways:

- Common actors: municipal transport departments, schools, cycling groups, neighborhood councils, and mobility service providers
- Challenges: lack of awareness, time constraints, accessibility barriers
- Proposals: translating materials, providing incentives, offering digital and physical participation options

F.2. Follow-up Online Workshop on Stakeholder Mapping

- Date: September 2025
- Format: 1-hour online session with interactive tool input
- Participants: Pilot cities and research partners
- Facilitators: Ethics and stakeholder engagement task leaders
- Purpose: Finalize stakeholder lists and gather feedback on engagement needs

Workshop Outcomes:

- Consolidated stakeholder lists from each city
- Clarified roles of schools, local businesses, citizen groups, and vulnerable communities



- Agreed on using standardized contact forms and ethical consent templates

Cross-city Observations:

- Cities prioritizing safety near schools had strong ties to education authorities
- Some cities aimed to involve mobility companies and public transport authorities in technical discussions
- Vulnerable group inclusion was a shared concern

F.3. Summary of Recommendations and Next Steps

- Use inclusive and translated materials during all engagement phases
- Ensure informed consent and privacy information is provided to all stakeholders
- Leverage local networks for recruitment and outreach
- Continuing bilateral meetings between cities and research teams to tailor engagement plans

11.1.7 ANNEX G – AI DEVICE COMPLIANCE GUIDELINES

This annex outlines the technical guidelines applied to the use of Artificial Intelligence (AI) systems devices within the MODALSHIFT project. These tools are utilized for collecting and analyzing data while ensuring full compliance with data protection and ethical standards, including the General Data Protection Regulation (GDPR).

G.1. Purpose and Scope

The MODALSHIFT project uses AI capabilities in selected pilot sites. Their deployment requires strict adherence to ethical and privacy standards.



G.2. AI System and Data Handling Specifications

- **Technology Used:** The MODALSHIFT project employs AI-based systems for traffic demand forecasting, transport network optimization, and predictive analytics. These tools support pilot cities in evaluating mode shift strategies by analyzing mobility patterns and simulating system responses.
- **Data Processing and Security:** All personal or sensitive input data such as GPS traces or user feedback is pseudonymized or encrypted (using AES-128 or higher) before being accessed by the AI tools. Only authorized partners designated in the Data Management Plan have access to the decryption keys. The processing infrastructure ensures that data remains protected during storage and inference cycles. Future iterations of the data management framework may consider the use of blockchain technology to enhance traceability, integrity, and auditability of data access and transformations. This could complement existing encryption and access control mechanisms by providing a tamper-proof log of data handling events.
- **Anonymization Process:** Where data cannot be used in its original form due to legal constraints, anonymization is applied using techniques that ensure compliance with the three GDPR criteria singling out, linkability, and inference. While standard cryptographic techniques like AES are used for securing access to raw data, the anonymization process itself relies on dedicated privacy-preserving methodologies such as spatial generalization, k-anonymity for trajectory data, and removal of sensitive points of interest. These approaches are distinct from encryption and are designed specifically to irreversibly prevent re-identification of individuals from mobility patterns.
- **AI Act Compliance:** The design and deployment of AI modules follow the EU AI Act guidelines, including transparency, accountability, human oversight, and bias mitigation. Regular audits and ethics checkpoints ensure that the algorithms operate fairly, without producing discriminatory outcomes.
- **Ethical and Legal Basis:** All AI data processing activities are justified under GDPR-compliant legal bases (e.g., consent, legitimate interest). The system's risk profile has been assessed and documented in the ethics self-assessment and privacy impact assessments.

G.3. AI Tool Deployment and Public Notification

- **Purpose of Data Collection:** AI systems deployed in the project are used for analyzing transport behavior, predicting modal shifts, and optimizing mobility networks. Data is collected solely for research and evaluation aligned with MODALSHIFT objectives.
- **Privacy and Anonymization Measures:** All personally identifiable data is pseudonymized before any analysis. For location-based or user-provided data, specialized anonymization techniques distinct from standard cryptographic measures are applied to comply with GDPR criteria (singling out, linkability, and inference prevention). These may include trajectory aggregation, generalization, or suppression of sensitive points of interest. The anonymization process ensures that individual identities cannot be inferred, either directly or indirectly, and is designed independently from encryption-based approaches such as AES, which are used only for secure transmission or storage.
- **Contact Information for Inquiries:** Public notices (online or in physical form, depending on local protocols) include contact details of the responsible data controller or partner organization to ensure transparency and facilitate data subject rights.
- **Public Access to Notices:** QR codes or hyperlinks redirecting to the privacy policy and detailed project description are made publicly available at pilot sites or through the project's dissemination channels to ensure informed awareness among the public.



G.4. Data Storage and Access Control

- **Secure Storage:** All collected and processed data whether from user apps, surveys, or AI systems, is stored on encrypted, access-controlled servers compliant with EU cybersecurity standards.
- **Data Access Control:** Only authorized personnel with relevant roles (technical operators, analysts, or data stewards) have access to datasets, with permissions managed through role-based access protocols and confidentiality agreements.
- **Data Retention Policy:** Data is retained only for the minimum duration necessary to carry out the defined analysis tasks. In alignment with GDPR and the project's Data Management Plan, raw data will be securely deleted after a fixed retention period typically no longer than [e.g., 6 or 12 months] or immediately following the completion of the analysis, whichever comes first. Retention periods are clearly documented for each dataset to ensure compliance and transparency.

G.5. Legal and Ethical Oversight

- **Legal Framework Compliance:** The use of AI systems and data handling procedures in all pilot sites adheres to national and EU-level data protection regulations, including GDPR and the evolving requirements of the EU AI Act.
- **Ethical and Legal Approvals:** Prior to deploying any AI-powered tool or collecting behavioral data, project partners ensure compliance with applicable legal frameworks. Local research ethics boards or municipal authorities are consulted where required.
- **Oversight Mechanism:** Ethical compliance is overseen by the MODALSHIFT Ethics Coordination Team, which monitors alignment with principles such as human agency, transparency, fairness, and data minimization. Guidance is also available to partners for handling edge cases and obtaining participant consent.

11.1.8 ANNEX H – VISUAL CONSENT FORM (MODALSHIFT)

Project title: MODALSHIFT

Coordinator: [Insert Coordinator's Name], Project Coordination Horizon Europe | [Insert Institution Name and Department]

Researchers: [Insert consortium Partners]

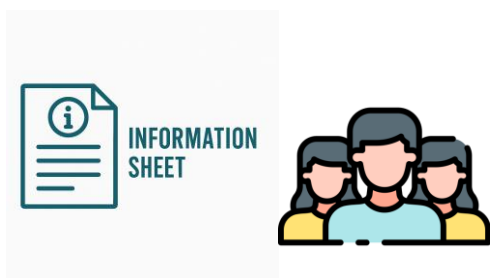


Creative Commons is an American non-profit organization and international network devoted to educational access and expanding the range of creative works available for others to build upon legally and to share.

With this form, you can choose whether to take part in this study or not.

Thank you for considering taking part in this research.

Before you make that decision, the researchers will give you an information sheet to read.



If you have any questions about it, please ask the researchers before you decide.

AGREE → → → TAKE PART

or

→ → DISAGREE

- confirm that I have read and understood the information sheet for this research. I have received sufficient information on how the project will process and protect my personal data. I have had enough time to consider the information, ask questions and have them answered satisfactorily.
- I understand that my participation is voluntary. And I am free to withdraw at any time. This would not cause any penalties for me, and I would not have to explain why.
- I understand that any information I give may be used in future publications or presentations about MODALSHIFT. And that this information may be communicated to others. This can only happen for scientific purposes. And it must comply with scientific ethical standards.

Scientific ethical standards are agreed ways that scientists should behave in their job. They should not act in a way that harms the interests of other people in any way.

I am aware that any personal data that I voluntarily share with the researchers will be processed following the European Union (EU) rules on the protection of natural people about the processing of personal data by EU bodies. These rules grant me the following rights:



- I can access my personal data at any time.
- I can ask if the researchers rectify any mistakes.
- I can demand that the researchers delete my data.
- I can expect that the researchers will only process my data in the ways described above.
- I can object if the researchers do not do this.



If I agree to being interviewed or observed by the researchers, I will tell them whether they can use any recording they make of it. I understand that any recording will be used only as an aid for the researchers or for communication activities strictly related to the research.

Encircle the answer that applies to you:

- I agree to take part in the research.
- I do not want to take part in the research.
- I want to leave the study. But the researchers can still use the data they collected so far.
- I want to leave the study. And I want the researchers to remove all my data that they have collected so far.

If you answered “a”, please encircle the answer that applies to you:

- I prefer to be referred to as ‘anonymous’ and to have my role described as (add description of your role, e.g., policymaker, citizen, transport operator)
- I prefer to be referred to as ‘anonymous’
- I am happy for you to mention my name and my role. *

*This choice can still be changed by the researchers if it is likely to cause you any harm. If I chose options a. or b., I understand that no information that identifies me will be made publicly available.



This question is optional, leave it blank if you do not consent. Otherwise encircle the option that applies to you.

I give my consent for the data collected from my participation in this study to be used for future research by:

- the same researchers
- the same researchers and other researchers

Any such future research will be aligned with the aims and values of this research.

Moreover, I provide my consent to the following activities:

- To be contacted by the MODALSHIFT Consortium in the next 4 years for matters related to project activities.

Yes No

- To be contacted by the MODALSHIFT Consortium for matters related to scientific research, even beyond the purposes of the current projects.

Yes No



Other entities, such as non-governmental organizations (NGOs), may want to use the collected data. This could be for purposes that you have not consented to here. If so, you will be notified and be given the chance to give or deny your consent to this.



Name of participant Date Signature

Name of researcher Date Signature

You will be given a copy of this signed document (consent form) to keep.

Contact details

If you have any questions or concerns regarding your participation in this research, please contact:

- [Insert name, email, and institution of responsible contact person]

