

MERIDIAN Deliverable 3 –

“D1.03 – PROPOSAL FOR A HARMONISED ITS BENEFIT ASSESSMENT METHODOLOGY FOR ITS CORRIDOR PROJECTS”

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Abstract

The complements presented below come from the previous experience in CEF evaluation programmes.

The evaluation methodology used, particularly adapted to ITS projects of traffic management and traffic information systems, was developed and approved within the framework of the Evaluation Group of the EU EIP.

This evaluation methodology is an integrated solution using an ex-ante method to determine the overall impact of the programme at the end of the programme.

D1.03 – Proposal for a harmonised ITS benefit assessment methodology for ITS corridor projects

Content

Document Information	1
1. Introduction	3
2. Objectives	4
3. Methodology.....	4
3.1. Key Performance Indicators (KPIs) & Data Collection Methods	5
Safety Improvements - Reduction in accidents, fatalities, and injuries	5
Traffic Efficiency - Improvement in travel time, congestion reduction, and reliability of travel times.....	5
Environmental Impact – Improved energy efficiency via reduction in emissions and fuel consumption.....	6
User Satisfaction - User acceptance, perceived benefits, and overall satisfaction with ITS services	7
3.2. Data Collection and Analysis.....	7
3.3. Reporting and Dissemination	7
4. Implementation Plan.....	8
4.1. Stakeholder Engagement.....	8
4.2. Pilot Projects.....	8
4.3. Training and Capacity Building.....	8
5. Expected Benefits	8
Standardisation	8
Improved Decision-Making	8
Enhanced Collaboration	9
Financial Benefits and ROI.....	9
6. Conclusion	9
7. References.....	10

1. Introduction

The rapid development and deployment of Intelligent Transport Systems (ITS) across Europe necessitate a standardised approach to assess their benefits. This proposal outlines a harmonised methodology for evaluating the impacts of ITS corridor projects, ensuring consistency, comparability, and reliability of results across different regions and projects.

Intelligent Transport Systems (ITS) are advanced applications that aim to provide innovative services relating to different modes of transport and traffic management. ITS enable users to be better informed and make safer, more coordinated, and smarter use of transport networks. In Europe, the deployment of ITS is important for enhancing the efficiency, safety, and sustainability of transport systems.

The European framework for ITS deployment is defined by Directive 2010/40/EU and its amendment, Directive (EU) 2023/2661, which updates the framework to reflect the Sustainable and Smart Mobility Strategy and the need for connected, automated and multimodal mobility. The amendment reinforces requirements for interoperability, data accessibility and integration with other modes of transport, and confirms the objective of bringing the death toll for all modes of transport close to zero by 2050, positioning ITS as a key enabler for safe, sustainable and resilient mobility. Within this framework, the European ITS Platform (EU EIP) Evaluation Group (Activity 5) has already developed and applied a common evaluation approach for CEF-funded ITS Corridors, demonstrating significant impacts and benefits of ITS investments in terms of safety, environment and congestion. This proposal builds directly on those results and on the operational experience from established corridor projects (e.g. MedTIS, MATIS, UMneo, MERIDIAN) where an integrated evaluation methodology has been used to calculate socio-economic benefits and profitability of corridor programmes.

The ITS Directive also focuses on establishing a harmonised methodology for assessing the benefits of Intelligent Transport Systems (ITS) in corridor projects. It aims to create a standardised approach to evaluate the effectiveness and impact of ITS implementations across different regions and projects.

Key points include:

- **Standardised Metrics:** The directive outlines specific metrics and indicators to be used in benefit assessments, ensuring consistency and comparability.
- **Data Collection and Analysis:** It emphasises the importance of robust data collection methods and advanced analytical techniques to accurately measure ITS benefits.
- **Stakeholder Involvement:** The directive encourages the involvement of various stakeholders, including public authorities, private sector entities, and end-users, in the assessment process.
- **Reporting and Transparency:** It mandates regular reporting and transparency regarding the assessment results to facilitate informed decision-making and continuous improvement.

This harmonised approach is expected to enhance the overall efficiency and effectiveness of ITS corridor projects, leading to better transport solutions and improved user experiences.

European funding instruments such as the Connecting Europe Facility (CEF) play a significant role in supporting ITS projects. The CEF provides funding for projects that improve Europe's transport, energy, and digital networks, while others like Horizon Europe support research and innovation activities that address global challenges and enhance Europe's competitiveness.

The Directorate-General for Mobility and Transport (DG MOVE) is responsible for developing and implementing European transport policies. DG MOVE provides policy guidance, regulatory support, and coordination among Member States to promote the deployment of ITS solutions that enhance the efficiency, safety, and sustainability of Europe's transport systems.

2. Objectives

The objectives are as follows:

- To provide a common framework for assessing the benefits of ITS corridor projects.
- To ensure that the assessment methodology is comprehensive and covers different dimensions such as safety, efficiency, environmental impact and user satisfaction.
- To facilitate the comparison of ITS projects in different European regions.
- To support decision-making processes by providing clear and reliable benefit assessments.

Currently, the assessment of ITS benefits faces several challenges:

- Lack of Standardisation: Different countries and regions use varying metrics and methodologies, making it difficult to compare results.
- Inconsistent Data Collection: Data collection methods and sources vary, leading to inconsistencies in the evaluation process.
- Varying Metrics: The performance indicators used to measure ITS benefits are not uniform, complicating the assessment process.

Therefore, a harmonised methodology is essential to address these challenges. It will provide a consistent framework for evaluating ITS projects, ensuring that assessments are comparable across different regions and countries in Europe.

3. Methodology

The methodology will cover all ITS corridor projects within the European Union, including but not limited to traffic management systems, public transport ITS, freight and logistics ITS, and connected and automated vehicle systems.

The development of the harmonised assessment framework will involve the following steps:

1. Stakeholder Consultations: Engage with key stakeholders, including government agencies, transport operators, and technology providers, to gather insights and requirements.
2. Literature Review: Conduct a comprehensive review of existing methodologies and best practices in ITS benefit assessment.
3. Best Practices Analysis: Identify and analyse best practices from successful ITS projects globally.

The evaluation methodology already applied in former corridor projects is an integrated solution that aims to determine the overall programme impact based on socio-economic savings and financial profitability:

- Safety savings (reduction in the number of accidents and in their severity)
- Congestion savings (reduction in the number of lost hours)
- Environmental benefits (reduction of tonnes of CO₂ over-emissions and of litres of fuel consumption)

This methodology is directly adapted to ITS programmes mainly composed of traffic management and information systems deployment, as long as the data of safety, congestion and environment from before project deployment are available from the operators.

If some data are not directly available, they should be estimated or completed with calculation models specially developed for that. The financial socio-economic benefits of the programme are calculated on the base of data given in the Handbook of external costs of transport (v 2019).

3.1. Key Performance Indicators (KPIs) & Data Collection Methods

The assessment is based on a set of standardised KPIs and data-collection methods. For each impact area, the following list specifies, in an operational form, the KPIs to track, the data sources to use, and the specific EU EIP indicator to apply in the benefit calculation:

Safety Improvements - Reduction in accidents, fatalities, and injuries

KPIs:

- Number of Accidents: Track the number and severity of accidents before and after the implementation of ITS solutions.
- Incident Response Time: Measure the time taken to respond to and clear incidents on the road.
- Safety Compliance: Monitor compliance with safety regulations and the use of safety features.
- Use these indicators for safety benefits calculation (EU EIP indicator: Change in accident numbers and severity).

Data Collection Methods:

- Accident Reports: Collect data from police and insurance reports on the number and severity of accidents.
- Use data from concessionaires (approved by the police, but more easily available).
- Incident Detection Systems: Use automated incident detection systems to monitor and record incidents in real-time.
- Use data from concessionaires, available under their contracts with the governments.
- Surveys: Conduct surveys with drivers and road users to gather feedback on perceived safety improvements.

Traffic Efficiency - Improvement in travel time, congestion reduction, and reliability of travel times

KPIs:

- Reduction in Travel Time: Measure the average travel time before and after the implementation of ITS solutions.
- Congestion Levels: Monitor traffic flow and congestion levels using traffic sensors and cameras.
- Use the EU EIP indicator: Change in bottleneck congestion with the calculation of the reduction in the number of lost hours.
- Vehicle Operating Costs: Calculate the reduction in fuel consumption and maintenance costs for vehicles.
- Use the EU EIP indicator: Change in CO₂ emissions, calculating the reduction of tonnes of CO₂ over-emissions and of fuel over-consumption. These calculations are performed

with a calculation model developed within the framework of the EU EIP Evaluation Group.

Data Collection Methods:

- Traffic Sensors: Use sensors to collect real-time data on traffic flow, speed, and congestion. E.g. inductive loop sensors, radar and lidar sensors, CCTV cameras.
- GPS Devices: Track vehicle movements and travel times using GPS data. E.g. GPS toll on-board units, telematics systems.
- Surveys: Conduct surveys with drivers and commuters to gather feedback on travel times and congestion. E.g. online survey platforms, mobile apps.
- Traffic Simulation Software: Tools like VISSIM, Aimsun, and SUMO simulate traffic flow and evaluate the impact of different ITS solutions.
- Data Analytics Platforms: Tools like Power BI and Python libraries (e.g. Pandas, NumPy) analyse and visualise traffic data.
- Geographic Information Systems (GIS): Visualisation and analysis of spatial data related to transport networks. E.g. ArcGIS (a comprehensive GIS platform for mapping and spatial analysis) or QGIS (an open-source GIS tool for visualising and analysing geographic data).

All the traffic data are mainly collected from automatic data collection systems based on loop sensors, radar and lidar sensors, CCTV systems and vehicle tracking systems. The missing data can be reconstructed from simulation models, already operational and specially developed for that purpose.

Environmental Impact – Improved energy efficiency via reduction in emissions and fuel consumption

KPIs:

- Reduction in Emissions: Measure the levels of pollutants such as CO₂, NO_x, and particulate matter before and after the implementation of ITS solutions.
- Fuel Consumption: Calculate the reduction in fuel consumption for vehicles.
- Energy Efficiency: Monitor the energy efficiency of transport systems and infrastructure.

Data Collection Methods:

- Air Quality Sensors: Monitor levels of pollutants such as CO₂, NO_x, and particulate matter in real-time.
- Weather Stations: Collect data on weather conditions that can affect traffic and emissions.
- Fuel Consumption Data: Collect data on fuel consumption from vehicles using telematics systems.
- Energy Monitoring Systems: Use energy monitoring systems to track the energy efficiency of transport infrastructure. E.g. smart meters, EMS.
- Use the EU EIP indicator: Change in CO₂ emissions, calculating the reduction of tonnes of CO₂ over-emissions and of fuel over-consumption. These calculations are performed with a calculation model developed within the framework of the EU EIP Evaluation Group. This model calculates the CO₂ and fuel benefits from the difference in vehicle consumption between free-flow and congested traffic. At this stage, reductions in NO_x emissions resulting from the project are not calculated.

User Satisfaction - User acceptance, perceived benefits, and overall satisfaction with ITS services

KPIs:

- User Experience: Measure user satisfaction with the ITS solutions through surveys and feedback.
- Adoption Rates: Track the adoption and usage rates of ITS solutions among users.
- Service Reliability: Monitor the reliability and availability of ITS services.
- Noise Pollution: Monitor the impact of the implementation on Noise Pollution according to Environmental Noise Directive 2002/49/EC and WHO guidelines.

Data Collection Methods:

- Surveys and Feedback Forms: Conduct surveys and collect feedback from users on their experience with ITS solutions.
- Usage Data: Collect data on the usage and adoption rates of ITS solutions through system logs and analytics.
- Service Monitoring: Use monitoring tools to track the reliability and availability of ITS services.

3.2. Data Collection and Analysis

The approach to data collection and analysis involves utilising a combination of primary data sources, such as surveys and field measurements, along with secondary data sources, including traffic databases and environmental reports. This approach employs various data collection methods, ranging from automated data collection systems and manual surveys to sensor networks. To thoroughly evaluate the collected data, a range of data analysis techniques is applied, including statistical analysis, cost-benefit analysis, and multi-criteria analysis.

The data collection and data processing used in corridor projects correspond largely to implementation of new traffic management systems and new software associated with them.

This approach should be extended by:

- Using harmonised data models and metadata aligned with EU ITS core service deployment guidelines and multimodal travel information service requirements, to facilitate cross-border data exchange and comparability.
- Applying advanced analytics and visualisation tools (e.g. Python libraries, Power BI, GIS platforms such as ArcGIS and QGIS) to explore spatial and temporal patterns, identify causal relationships, and support scenario analysis.
- Ensuring data quality through systematic validation, calibration of simulation models, and documentation of assumptions and uncertainties, particularly for ex-ante evaluations.

3.3. Reporting and Dissemination

Reporting is based on standardised templates that ensure consistency in presenting assessment results, aligned with the EU EIP Evaluation Report Template and ITS Toolkit developed by the Evaluation Group. Corridor projects such as MedTIS, MATIS, and UMneo have already produced evaluation reports and plans delivered to the European Commission.

Dissemination includes sharing findings through academic publications, industry reports, public presentations, and contributions to European platforms and handbooks (e.g. updates to the ITS Reference Handbook and implementation handbooks for Delegated Regulations).

4. Implementation Plan

4.1. Stakeholder Engagement

Engagement with EU agencies is pursued to gather input and ensure the methodology meets their needs.

Other key stakeholders are also involved, including:

- Government Agencies: provide regulatory support and funding.
- Transport Operators: implement ITS solutions and provide operational data.
- Technology Providers: supply ITS technologies and technical expertise.

It is suggested to formalise stakeholder engagement through regular workshops, joint working groups on evaluation and data, and contributions to EU-level expert groups, building on the collaborative model of the EU EIP Evaluation Expert Group.

4.2. Pilot Projects

EU-funded projects cooperate to test and refine the methodology before full-scale implementation. These projects will serve as case studies to fine-tune and refine the assessment framework.

4.3. Training and Capacity Building

Training and capacity building ensure that all relevant parties are equipped to apply the methodology effectively. MERIDIAN and MATIS are ready to present their evaluation methodology (data used, principles of the calculation process based on the reduction in response times, calculation models used, impact results delivered), in line with international work such as the OECD report on the impact of new technologies on road safety.

Capacity building activities include training sessions for corridor project teams, guidance documents, and peer-learning formats, as well as contributions to EU-level implementation handbooks for ITS and multimodal travel information services.

5. Expected Benefits

Standardisation

The harmonised methodology will lead to standardised assessments, facilitating cross-border comparisons and benchmarking of ITS projects.

Improved Decision-Making

A consistent assessment framework will support better decision-making for future ITS investments, ensuring that resources are allocated to projects with the highest potential benefits. The integration of ex-ante and ex-post evaluation, advanced analytics and new dimensions such as resilience and equity provide richer insights for project selection, design and prioritisation.

Enhanced Collaboration

The methodology promotes increased collaboration among European countries and stakeholders, fostering a more integrated and efficient transport network. Shared indicators, data models and reporting templates facilitate cooperation between corridors and projects, and support contributions to EU-level monitoring and policy development.

Financial Benefits and ROI

A common approach to estimating the financial benefits of programmes, in particular to calculate a pragmatic and realistic ROI of the programme (e.g. 4–5 years as achieved in the MedTIS 3 evaluation), is also to be achieved. Using the Handbook on the external costs of transport (2019) and harmonised benefit calculation methods,

6. Conclusion

A harmonised ITS benefit assessment methodology will provide a robust framework for evaluating the impacts of ITS corridor projects across Europe. By standardising the assessment process, the benefits of ITS can be accurately measured, facilitating better decision-making and fostering the continued development of intelligent transport systems. With standardised evaluations, the results of different ITS projects can be directly compared. This means that stakeholders can easily see which projects are more effective, efficient, and beneficial. The ability to compare projects accurately provides valuable insights for decision-makers. They can use this information to make informed choices about where to allocate resources and which projects to prioritise. Decision-makers can identify the ITS projects that offer the highest returns on investment, ensuring that funds are allocated to the most impactful initiatives. The insights gained from standardised evaluations help in strategic planning and policy development. Stakeholders can set clear goals and objectives based on the performance of previous projects. By comparing the benefits of different projects, resources can be optimised and directed towards initiatives that deliver the greatest benefits in terms of traffic efficiency, safety, environmental impact, and user satisfaction.

Adopting a common methodology, at least for some families of activities (e.g. traffic management systems), seems realistic and in line with the conclusions of the EU EIP Evaluation Group.

This proposal outlines the need for a harmonised ITS benefit assessment methodology and provides a detailed plan for its development and implementation. The proposed methodology will address current challenges and support the effective evaluation of ITS projects across Europe.

On this basis, MERIDIAN issues the following call to action:

“We encourage stakeholders to support this initiative and actively participate in the development and implementation process. Together, we can enhance the efficiency, safety, and sustainability of Europe's transport systems.”

7. References

- EU EIP Activity 5: Evaluation – Final Report, 2022. European ITS Platform Evaluation Expert Group.
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