OPTI-UP

D.1.3.2 Comprehensive Strategy for Sustainable and Efficient Public Transport Networks in Central Europe

Final version

October 2025

Table of Contents

List of Figures

List of Tables

Abbreviations

AI	Artificial Intelligence
APC	Automatic Passenger Counting
BAU	Business as usual
CLMS	Copernicus Land Monitoring Services
DRT	Demand-responsive transport service
DUJPP	*Družba za upravljanje javnega potniškega prometa*
GIS	Geographic Information System
GTFS	General Transit Feed Specification
ITS	Intelligent Transportation Systems
KPI	Key Performance Indicators
LPTP	Local Public Transport Plan
LUTI	Land Use-Transport Interaction model
MaaS	Mobility-as-a-Service
MARS	Metropolitan Activity Relocation Simulator model
OD	Origin-destination
OPTI-UP	Optimising and Greening Public Transport networks through Integration with Urban Planning and data-driven approaches
OSM	OpenStreetMap
P+R	Park and Ride
PT	Public Transport
SUMP	Sustainable Urban Mobility Plan
SWOT	Strengths, Weaknesses, Opportunities and Threats

Executive Summary

This strategy document has been developed within the framework of the OPTI-UP project (*Optimising and Greening Public Transport networks through Integration with Urban Planning and data-driven approaches*), which aims to support small and medium-sized cities in Central Europe in designing and implementing more efficient, sustainable, and integrated public transport systems.

These urban contexts often face specific challenges such as limited financial and technical resources, fragmented datasets, and a lack of structured planning experience. **The OPTI-UP methodology proposed in this document addresses these challenges by offering a flexible comprehensive planning framework that can be tailored to different urban contexts and capacities.**

The methodology is designed not as a rigid blueprint, but as a practical guide to help cities structure their planning processes in a transparent, evidence-based, and participatory manner. It promotes the integration of public transport planning within broader urban development goals and aligns local actions with national and European strategies, such as the European Green Deal, sustainable mobility frameworks, and climate neutrality objectives.

The ultimate aim is to enable cities to build coherent, actionable and measurable plans that enhance long term investment, service quality and resilience.

The planning process begins with a thorough review of strategic and regulatory frameworks at the European, national, regional, and local levels, ensuring that local objectives are rooted in broader policy agendas.

This is followed by a contextual analysis of the local territory, population, and transport systems, supported by both quantitative data and qualitative insights gathered through citizen surveys. These inputs help build a user-centred foundation and highlight specific issues of accessibility, service coverage, and user satisfaction.

Based on this analysis, a structured assessment of Strengths, Weaknesses, Opportunities, and Threats (SWOT) is carried out to identify the internal strengths and weaknesses of the local public transport (PT) system and spatial planning, as well as external opportunities and threats. This diagnostic phase is complemented by a review of best practices from other cities, helping to identify innovative, feasible, and transferable solutions.

The combination of local knowledge and external inspiration forms the basis for the definition of a long-term vision for each city's public transport system, which is then articulated

into a set of strategic goals. These goals are structured around four key dimensions:

- Mobility,
- Economy,
- Society, and
- Environment

and are subjected to a coherence analysis to ensure alignment with higher-level planning frameworks.

Strategic goals are then developed within this structure and tested for coherence with higher level policy objectives. Each goal is linked to concrete actions, and described in terms of rationale, expected outcomes, strategic values and validated through transport modelling tools such as four-step transport models and Land Use-Transport Interaction (LUTI) models. These tools help simulate short- and long-term impacts and allow for the comparison of alternative scenarios. This modelling phase supports evidence-based decision-making and increases the credibility of the proposed measures.

Stakeholder engagement is a transversal element of the process. Public institutions, private transport operators, and civil society are involved through structured consultations, meetings, and study visits. Their perspectives help shape priorities and ensure that the resulting plans reflect a wide range of interests and needs, fostering local ownership and easing future implementation.

It is important to highlight that the OPTI-UP project identified significant shortcomings in the technical capacities of various stakeholders in the context of transport modelling and public transport planning based on analytical foundations. This is certainly an area that needs to be strengthened to ensure that PT systems and sustainable mobility are developed in an efficient and purposeful manner.

For each validated action, a detailed implementation plan is then prepared. This includes resource allocation, scheduling, stakeholder responsibilities, expected impacts, and risk mitigation strategies.

To support long-term governance, the strategy also outlines a monitoring and evaluation framework, with clear Key Performance Indicators (KPIs), measurement methods, data sources, and target values. This ensures transparency, facilitates continuous improvement, and enhances replicability.

Beyond its methodological rigor, the approach proposed by the OPTI-UP project delivers a series of strategic benefits. It fosters transparency towards stakeholders and institutions, strengthens citizen understanding and acceptance of public transport strategies, and creates favourable conditions for attracting investors and collaborators. Moreover, by establishing a clear and replicable planning process, the methodology enhances local capacity, ensures the traceability of decisions, and provides a valuable reference for future planning efforts both within and beyond the participating cities.

This document is not just a planning guide, but a strategic reference for cities that want to meet both local mobility needs and broader regional, national and European objectives.

By adopting this framework and adapting it to their specific contexts, even small and medium-sized cities can try to plan resilient transport systems that improve quality of life, reduce environmental impact and foster economic growth.

How to Use This Document

This Strategy has been designed as a practical and adaptable guide for improving public transport systems and incorporating spatial planning in small and medium-sized cities across Europe. Recognizing the diversity in available resources, institutional capacity, and urban context, the document is intentionally flexible and modular in structure, allowing cities to engage with the content at the level most appropriate for their needs.

Target Audience

This Strategy is intended for a wide range of actors involved in urban mobility and public transport planning, particularly in cities with limited capacity or fragmented institutional support. The primary target groups include:

- Municipal governments and public administration officials responsible for local mobility and transport planning.
- Public transport authorities and operators, especially those seeking to improve coordination, service quality, and system sustainability.
- Regional development agencies and planning institutions working on integrated territorial strategies.
- Urban planners and technical consultants involved in transport assessments, modelling, and infrastructure development.
- Decision-makers and political representatives who need a strategic framework to support investment decisions.
- Stakeholders involved in participatory planning, such as NGOs, community organizations, and business representatives.

Purpose and Use

This document can be used in three complementary ways:

- As a Strategic Guide
    - It offers a step-by-step methodology to support the development of local public transport strategies aligned with broader urban, spatial planning and environmental goals. Cities can follow the recommended sequence of actions to build a robust and evidence-based planning process.
- As a Reference Framework
    - Cities with existing mobility plans can use this document to benchmark their approach, validate planning assumptions, or identify gaps in policy integration, stakeholder engagement, or impact monitoring.
- As a Planning Toolkit

- The Strategy includes templates, examples, and suggested indicators that can be directly applied or adapted to local needs. It functions as a working manual to support day-to-day tasks related to transport system analysis, action planning, and scenario testing.

Introduction

The objective of this document is to outline a comprehensive Strategy for improving public transport systems and incorporating spatial planning for all small and medium-sized European cities. This document presents a practical and adaptable methodology developed within the OPTI-UP project to support small and medium-sized cities in Central Europe in **planning and improving their public transport systems**. The strategy responds to common challenges faced by these cities—such as limited budgets, fragmented data, and insufficient planning capacity—by offering a structured, evidence-based framework that links public transport development with urban planning and sustainability goals.

Grounded in real-world pilot experiences across six diverse cities, the methodology combines technical tools (e.g., SWOT analysis, transport modelling, KPI-based monitoring) with participatory approaches and policy alignment. It guides cities through the full planning cycle: **from diagnostic analysis and goal setting to action planning, scenario testing, and evaluation.**

By balancing analytical rigor with practical flexibility, the methodology enables cities to design public transport strategies that are not only technically sound, but also feasible, inclusive, and aligned with long-term development objectives. It serves as both a technical guideline and a strategic reference to strengthen institutional capacity and support sustainable urban mobility across the region. **This document supports cities in envisioning, designing, implementing, and monitoring a Local Public Transport Plan (LPTP).**

A Local Public Transport Plan is a strategic planning document, drawn up by local authorities, which defines the organisation, objectives and guidelines for public transport services within a specific area. It defines the structure of the transport network, service levels, routes, timetables, integration with other modes of transport and policies aimed at improving the accessibility, efficiency and sustainability of mobility for residents and visitors. The OPTI-UP project aims to **improve PT systems** in small and medium-sized cities in Central Europe **by combining the development of a supportive planning methodology with the implementation of pilot actions**. It promotes the **integration of PT with urban planning and data-driven approaches**, with the goal of increasing accessibility, reducing transport-related emissions, and contributing to a more sustainable future for Central European cities.

The project includes **three types of pilot actions** implemented across six cities in the Central European region:

- Optimisation of PT networks through integration and reallocation of existing lines,
- Development or enhancement of demand-responsive transport (DRT) services to serve low-demand or rural areas,

- Introduction of electric or low-emission vehicles in PT systems to support sustainable mobility.

This document introduces a methodology specifically designed to support the development of local public transport plans in small to medium-sized European cities. These urban contexts often face considerable challenges:

- Limited public budgets,
- Scarce technical expertise, and
- Insufficient experience in structured mobility planning processes.

As a result, local authorities may lack the capacity to design effective, evidence-based interventions to improve public transport services and their integration with wider urban development goals. **In many cases, small and medium-sized cities also suffer from limited availability of data, or from datasets that are incomplete, outdated, or not readily usable for planning purposes. For example, lacking Geographic Information System (GIS) formats or standardized structures needed for spatial analysis and modelling.**

These gaps further complicate efforts to build robust transport strategies and highlight the need for methodologies that are both technically sound and sensitive to local capacities.

The proposed methodology seeks to address these barriers by offering a comprehensive yet flexible planning framework. It is intended not as a rigid blueprint, but as a supportive guide adaptable to different urban contexts, and particularly suited to cities where resources are limited. The methodology combines analytical rigor with pragmatic guidance, enabling cities to make informed decisions and build feasible, context-aware plans without excessive complexity or workload.

The methodology provides practical steps and tools to implement a broader strategy aimed at enhancing public transport systems and can be used by cities as a technical guideline for local planning.

Beyond its technical strengths, the methodology explained in this document also delivers key strategic benefits:

- It provides an overview of the planning process and key steps in a single document, serving as a technical guideline.
- It increases transparency towards stakeholders by clearly structuring decision-making processes and criteria.
- It improves understanding and acceptance by citizens, thanks to its emphasis on inclusiveness and evidence-based justification of actions.

- It enhances the potential to attract investors and collaborators, by providing a structured, credible framework aligned with broader sustainability and innovation goals.
- It ensures a procedural approach that supports comprehensive and consistent planning across different thematic areas and scales.
- It creates a detailed, retraceable process that can be used as a reference for future planning cycles and as a replicable model for other cities facing similar challenges.

In this way, the methodology not only supports better public transport outcomes, but also strengthens the institutional capacity and strategic positioning of small and medium-sized cities within broader regional and European development dynamics.

A Step-by-Step Planning Strategy

The methodology unfolds as a structured process that begins with **a thorough diagnostic phase**. Cities are guided to carry out a contextual analysis covering four core dimensions:

- Transport infrastructure - including roads, transit networks, interchanges, public transport stops, and active mobility infrastructure.
- Transport services - such as public transport availability, frequency, coverage, and multimodal integration.
- Demographic and socio-economic conditions - including population distribution, age structure, and vulnerable user groups.
- Land use and territorial structure - focusing on the spatial organization of key functions such as housing, work, education, and services.

This analysis ensures that planning efforts are firmly rooted in a solid understanding of local conditions and mobility needs.

To complement this, the methodology encourages cities to **review higher-level policy frameworks**, from national mobility strategies to European Green Deal goals and regional transport plans, ensuring coherence and alignment with overarching priorities.

The methodology includes a dedicated phase for **benchmarking against best practices**, encouraging cities to identify and learn from successful interventions in comparable contexts. Case studies from other small and medium-sized cities help illustrate feasible solutions, reveal common pitfalls, and inspire innovative ideas adapted to local realities.

All this information is then synthesized into a **SWOT analysis,** summarizing the internal Strengths and Weaknesses of the city's current mobility system, and the external Opportunities and Threats that might shape the future. The SWOT serves not only as a diagnostic tool but also as a strategic filter, helping cities focus on key challenges and leverage existing assets.

Building on the SWOT, cities are supported in **formulating a shared vision for the future of public transport**, along with a set of strategic goals that translate this vision into concrete directions for action. These goals serve as a bridge between analysis and implementation, anchoring the plan in both aspiration and evidence.

Next, cities identify and select a **portfolio of possible actions** ranging from service optimization and DRT to infrastructure upgrades, fleet renewal with low-emission vehicles, pricing strategies, and governance improvements. These actions are not selected in isolation: they are framed within an integrated scenario analysis, tested using traditional four-step transport demand models or other specialized types of models, e.g., LUTI, when needed. These models allow cities to **simulate various planning scenarios**, each combining different exogenous assumptions (e.g. population growth, fuel prices, climate policies) and different configurations of the proposed actions.

The **scenario testing phase** is central to the methodology's commitment to evidence-based planning. It allows cities to compare the likely impacts of different choices across multiple performance indicators such as accessibility, emissions, public transport ridership, and financial sustainability. This empowers decision-makers to prioritize actions that are not only ambitious but also realistic, cost-effective, and aligned with broader sustainability goals.

Based on the modelling outcomes, the **selected actions are refined and further specified**. The methodology supports cities in drafting a preliminary action plan, detailing timelines, responsibilities, resource needs, and dependencies.

To ensure that plans remain relevant and responsive over time, the methodology includes the **development of a monitoring and evaluation framework**. This framework identifies a set of KPIs aligned with the plan's goals, enabling local administrations to track progress, assess the effectiveness of actions, and adjust the strategy as needed. Monitoring is not treated as a bureaucratic requirement but as an integral part of the planning cycle, a tool for learning, accountability, and continuous improvement.

Piloting and Refining the Methodology

The methodology was tested through **pilot applications in six different OPTI-UP cities,** selected to reflect a range of geographic, demographic, and institutional contexts. These pilot projects were crucial for calibrating the methodology and ensuring its applicability across diverse conditions. They revealed several recurring challenges such as **difficulties in data collection, modelling capacity, or stakeholder engagement** that were addressed by simplifying some components, improving guidance materials, and proposing standard templates and tools to reduce the workload on local staff.

Importantly, the pilot phase confirmed that even cities with limited resources can adopt structured and strategic planning approaches, provided they receive adequate methodological support. The experiences also demonstrated the value of peer learning and technical exchange among cities facing similar constraints.

In summary, this document proposes a pragmatic yet comprehensive methodology for developing local public transport plans tailored to the specific needs of small and medium-sized European cities. By balancing ambition with feasibility, and structure with flexibility, the methodology provides a valuable tool to support cities in making progress toward more inclusive, efficient, and sustainable mobility systems.

Scope and Methodology

This strategy document aims to support small and medium-sized cities in structuring the planning process for public transportation improvements. The proposed methodology provides a structured approach to facilitate transparent decision-making by government and service operators, ensuring that interventions are aligned with broader urban mobility goals. Improved accessibility, environmental and economic sustainability, and social equity are considered, promoting balanced and informed development of existing public transport systems.

The proposed methodology was not developed in isolation, but through an iterative, step-by-step process carried out in close collaboration with the partner cities of the OPTI-UP project. This co-design approach ensured that each phase of the methodology was critically reviewed and adapted to fit the practical realities of small and medium-sized cities in Central Europe.

Each methodological component was tested and refined based on direct feedback from local stakeholders, ensuring that the proposed framework remains both realistic and applicable.

To support this process, various collaborative tools were employed including structured templates, short internal surveys, and one-to-one meetings focused on explanation, brainstorming, and joint compilation. This continuous exchange allowed for the validation and adjustment of each element, reinforcing the adaptability of the methodology and enhancing its relevance to diverse local contexts.

The proposed methodology can be summarised in the following points and diagram (Figure 1).

- **Contextualisation and Preliminary Analysis (Chapters 1, 2, 3)**
  - The planning process begins with a review of strategic planning documents and mobility frameworks at all governance levels. This ensures that local objectives are embedded within wider policy agendas, such as the European Green Deal, national mobility strategies, and regional transport plans. At the local level, the analysis focuses on the state of the territory, the population, and the city's PT system, combining both qualitative and quantitative components. Citizen surveys provide insights into travel behaviour, satisfaction levels, and improvement priorities, enabling a user-centred foundation for planning.
- **SWOT-Analysis and Best Practice Integration (Chapters 4, 5)**
  - A structured SWOT analysis identifies the internal strengths and weaknesses of the local PT system and spatial planning, as well as external opportunities and threats. This analysis is informed by previous technical reports and local knowledge, and it serves to contextualise local actions within realistic

constraints and potentials. Alongside SWOT, a review of best practices, both from within the region and from international case studies, is conducted to support the formulation of innovative and feasible interventions.

- **Vision and Goal Setting (Chapter 6)**
  - Drawing on the review of strategic planning documents, SWOT analysis and survey results, each city defines a long-term vision for its public transport system. This vision is operationalized through a set of strategic goals classified into four dimensions: mobility, economic, social, and environmental. A key element of the methodology is coherence analysis, which systematically verifies the alignment of local goals with those established at higher levels of planning.
- **Action Definition and Model-Based Validation (Chapters 7, 8)**
  - The methodology foresees the definition of concrete actions addressing the identified goals. Each action includes a brief rationale, expected outcomes, and its strategic relevance. These actions are then tested through transport modelling tools (e.g., four-step models for short-term impact forecasts and LUTI for long-term system-level prognosis) to simulate their potential impacts. Model-based validation helps identify the most effective scenarios and supports evidence-based policy design.
- **Stakeholder Engagement (Chapter 9)**
  - Stakeholder engagement is integrated throughout the process to foster shared ownership and facilitate implementation. Key actors from institutional, private, and civil society sectors are identified and involved through structured engagement formats, including meetings, consultations, and study visits. Their roles and influence are mapped to ensure a balanced and inclusive process.
- **Action Plan Structuring (Chapter 10)**
  - For each validated action, a detailed implementation plan is developed. This includes resource allocation, a defined timeline with milestones, a stakeholder involvement matrix, expected impacts on users and the urban environment, and a risk analysis with mitigation strategies. This structured approach ensures that actions are both actionable and robust.
- **Monitoring and Evaluation (Chapter 11)**
  - A comprehensive monitoring framework is established to track progress over time. Key Performance Indicators are defined for each action, accompanied by specific units, target values, and measurement methodologies. Data sources and tools for KPI calculation are identified to ensure methodological transparency and replicability. This monitoring process supports continuous learning and adjustment throughout implementation.

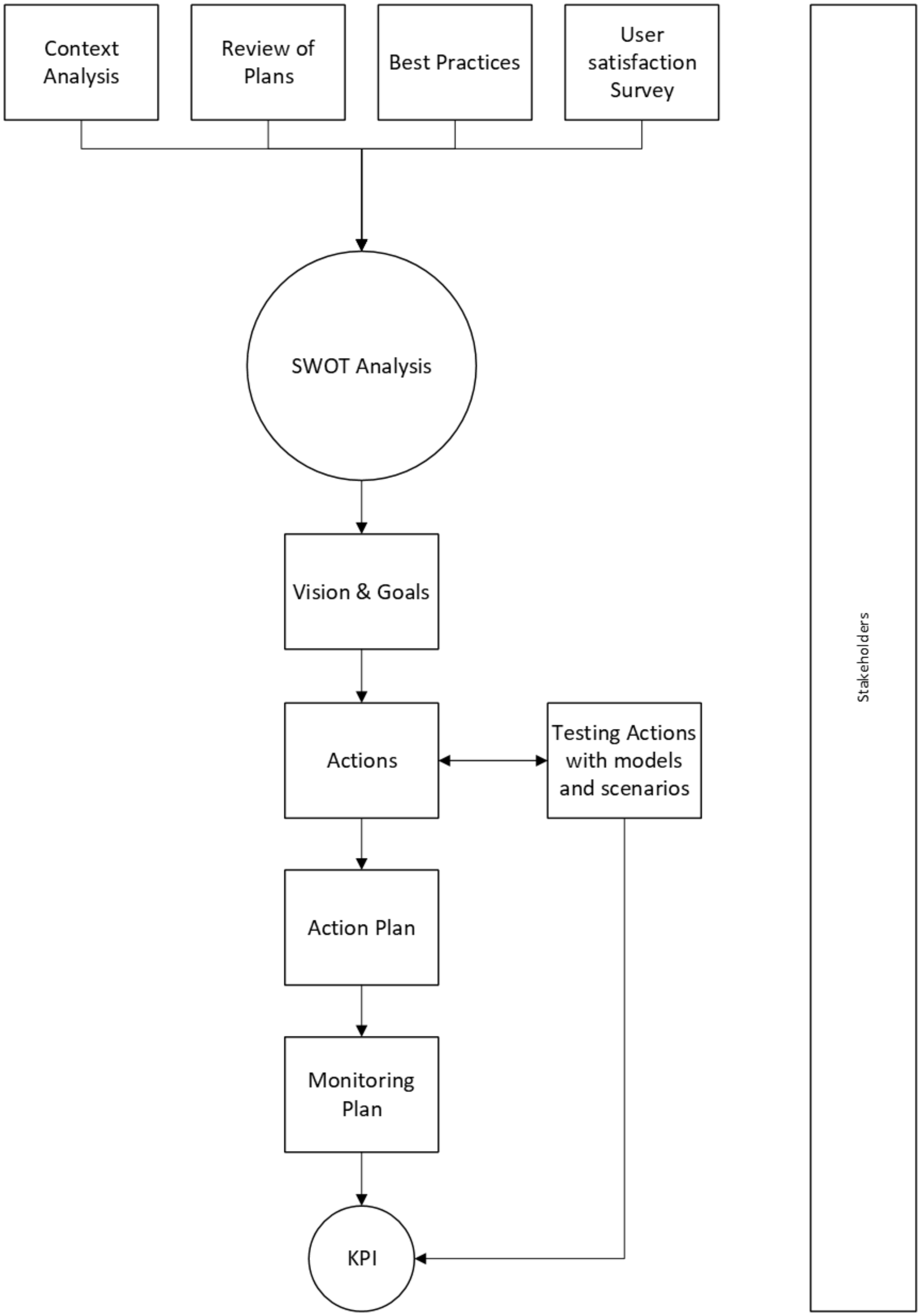

Figure 1 Methodological scheme [Source: Poliedra]

Methodology in details

The methodological framework introduced above is here expanded and explored in detail, providing a step-by-step practical guide designed to facilitate and support the development of local public transport plans in small and medium-sized cities, including those with limited prior experience in this type of activity.

The proposed methods are accompanied, where relevant and useful, by application examples drawn from the OPTI-UP project's pilot cases, which served as a testing ground for validating the overall strategy. These examples help illustrate how the approach can be adapted to different local contexts while maintaining a consistent planning structure.

1. Analysis of the Status Quo of the Public Transport Systems

A detailed understanding of the local context is a critical starting point for designing effective public transport strategies in small and medium-sized cities. This analysis combines demographic, spatial, operational, and financial dimensions to provide a solid knowledge base for informed decision-making.

Key elements include population dynamics, age and gender distribution, and density patterns, which help identify current and future mobility needs. When cross-referenced with spatial and land-use data, these insights support the identification of underserved areas, potential corridors of demand, and priority zones for intervention.

The analysis also needs to consider the operational characteristics of existing public transport systems, such as network configuration, fleet composition, service frequency, and ridership volumes. While such data are often available from local transport operators or municipal sources, in many cities the information may be fragmented, insufficiently detailed, or even inaccurate, as operators may report different figures depending on contractual requirements. In these cases, simplified data collection methods such as manual counts, short field surveys, or stakeholder interviews can be used to produce meaningful estimates that still enable progress in the planning process.

Demand-side indicators, including ridership trends and temporal variations, provide valuable input to assess system performance and user needs. Where advanced systems like automatic passenger counters or ticketing databases are not available, simpler tools (e.g. peak-hour observations or survey-based estimations) can still yield actionable insights. Depending on the type and size of the system, three types of passenger counts are most commonly conducted in the field:

- **Boarding and alighting counts inside vehicles:** This method provides detailed data on the lines operated by the vehicles, but it is more resource intensive. It is recommended when there is a need to analyse a smaller segment of the network, i.e., a limited number of lines in a more detailed and accurate way.

- **Boarding/alighting counts at stops:** This method allows for cost-effective coverage of a larger part of the network, especially when conducted at stops served by multiple lines. However, such data do not provide detailed insights into demand per line, but they can offer general indications of system-wide transport demand.
- **Combined counting in vehicles and at stops:** This approach enables efficient coverage by providing both detailed line-/vehicle-specific data and broader network-level demand through stop-based counting.

Financial data covering both costs and revenues are essential to evaluate the sustainability and cost-effectiveness of the service. Even when detailed accounting is not accessible, basic financial figures can support an initial understanding and guide the development of more refined assessments over time.

Financial indicators such as cost and revenue reflect the efficiency of the system and are crucial for understanding its overall quality.

A key factor that should be derived from financial reports is the cost per vehicle-kilometre of service. While there are many cost components, they can generally be grouped into three main categories:

- Labour costs (drivers, mechanics, cleaners, dispatchers, etc.),
- Vehicle and operation costs (energy, fuel, spare parts, depreciation, etc.),
- Other overhead costs (office expenses, uniforms, garage rent, etc.).

It is important to note that optimizing labour costs has the greatest impact on the cost-efficiency of the service. By optimizing route design, driver shifts, and vehicle operating speeds, it is possible to significantly reduce the overall operational costs of the public transport service.

Whenever possible, the use of GIS-based analysis and open data sources can significantly enhance the spatial and operational understanding of the public transport system.

In particular, General Transit Feed Specification (GTFS) data can be a powerful resource for analysing route structures, service frequencies, stop locations, and schedule reliability, especially in cities where digitalisation of transit information is already in place. When available, GTFS feeds can be imported into GIS software, or transport modelling software, to perform detailed accessibility, coverage, and frequency analyses, or used in combination with other datasets to model user experience and multimodal integration.

For the activities mentioned above, it is often necessary to engage a transport planning expert who can effectively collect and interpret the relevant data.

To support a comprehensive analysis, the following data sources are recommended:

- **Spatial and Transport Network Data:**
  - OpenStreetMap (OSM) – provides detailed maps, road networks, stop locations, and infrastructure elements.
  - GTFS Feeds – official public transport schedules and routes (where published).
  - National GIS Portals – often managed by national geodetic or spatial planning agencies.
  - EU Open Data Portal – includes transport, infrastructure, and territorial cohesion data.
  - Copernicus Land Monitoring Services (CLMS) – high-resolution land use and land cover datasets.
- **Demographic and Socio-Economic Data:**
  - Eurostat – harmonised demographic, economic, and regional statistics across EU member states.
  - National Censuses – population structure, age, education, household data (e.g. statistical offices or bureaus).
  - Urban Audit/Cities Statistics Database (Eurostat) – data specific to urban areas in Europe.
  - ESPON Database – European spatial planning indicators and territorial typologies.
- **Public Transport System Data:**
  - Transport Operators – operational reports, ticketing data, ridership volumes, financial statements.
  - Mobility-as-a-Service (MaaS) Platforms – where available, often offer real-time and historical data streams.
  - Automatic Passenger Counting (APC) Systems – for detailed boarding/alighting data (where installed).
  - Surveys and Manual Counts – when no automated systems exist, still highly valuable for calibration.

These data sources can be combined and cross-referenced to produce high-quality visualisations, maps, and analytical outputs.

Even in cases where local data are sparse or inconsistent, many of these external sources, especially open European datasets, can offer a starting point for building a reliable knowledge base.

By integrating available data, whether local or external, detailed or simplified, this context analysis builds a realistic, scalable, and evidence-based foundation for the next phases of strategic public transport planning. It ensures that local conditions, limitations, and opportunities are properly identified, while promoting comparability, transparency, and long-term replicability of planning processes across different European cities.

Structure of the Status Quo Analysis

The following summary outlines the structure that was adopted for the status quo analysis in the six pilot cases of the OPTI-UP project (Figure 2). It has proven to be well-suited and appropriately calibrated to guide the initial analytical phase in small and medium-sized European cities.

This structure provides a **comprehensive yet adaptable framework to capture the key demographic, spatial, operational, demand-related, and financial characteristics of the local PT system.** Its flexible design allows it to be applied even in contexts where data availability may be limited, ensuring that the planning process can advance based on the best available information.

The approach is intended to support cities in building a solid knowledge base from which to define strategic objectives and develop tailored interventions in subsequent phases of local public transport planning.

1. Spatial/Demographic Analysis
    - 1.1 Population trend
    - 1.2. Population structure by age and gender
    - 1.3. Population density
2. Pt history and operation status in case study areas
    - 2.1. The history of the pt services
    - 2.2. Fleet composition
    - 2.3. Key operational statistics
        - 2.3.1. Number and line length
        - 2.3.2. Turnaround time and operational speed
        - 2.3.3. Number of departures
        - 2.3.4. Volume of service
    - 2.4. Derived operational statistics
3. Pt demand analysis
    - 3.1. Demand trend in the past five years
    - 3.2. Monthly demand
    - 3.3. Hourly demand
    - 3.4. Derived demand statistics
4. Pt financial indicator analysis
    - 4.1. Cost and revenue trend
    - 4.2. Cost and revenue structure
        - 4.2.1. General observations
        - 4.2.2. Derived financial statistics

Figure 2 Structure of the status quo analysis [Source: OPTI-UP project team]

Table 1 presents the categories and items of analysis statistics that can be used to build a holistic understanding of the operating context of PT in a city from various aspects. The analysis typically begins with **general socio-demographic indicators to establish the size and characteristics of the city** served by the PT system, specifically in terms of area, population, and population density. Understanding the historical development of the PT system and spatial planning is also valuable, as it provides context for the cumulative trends in PT infrastructure growth and utilization over time.

On the **supply side**, detailed statistics can be examined across **three key domains to measure the availability and intensity of PT** service provision:

- **Fleet characteristics**: including fleet size, vehicle age, and passenger capacity.

- **Infrastructure**: such as the number of lines, total network length, and stop distribution.
- **Operational performance**: including average speed, service frequency, and punctuality.

On the **demand side**, insights can be drawn from data on **passenger volumes** from the annually, monthly, and hourly statistics. Derived indicators such as **ridership per line, per departure, or per vehicle-kilometre** offer a more nuanced understanding of system utilization and efficiency.

Financial statistics form another critical component of the analysis. **Cost data** generally cover expenses related to staff, operations, and maintenance. **Revenue data** include income from ticket and pass sales, as well as government subsidies, which are often substantial in small- and medium-sized European cities where PT usage tends to be lower.

Finally, a qualitative overview of **stakeholder involvement** across different phases of PT planning helps to map the network of responsibilities and decision-making authority. This perspective is essential for understanding governance dynamics and coordination among public agencies, operators, and other relevant stakeholders.

Table 1 Analysis of the status quo of PT operations [Source: OPTI-UP project team]

Analysis/Statistics	Data collection/computation	Contribution to insights on
Spatial-demographic statistics		
Population trend: city, region, nation	Statistics on the population in the past 30-40 years at every 5-10 years	1. Size of the city 2. Future population prediction
Population structure by age and gender	Statistics on population by age bins (5-10 years) and gender, presented in a pyramid graph	1. Gender distribution of the potential PT users 2. Potential demand from different age groups: <15 years old: students; 16-64-years old: commuters; >65 years old: pensioners
Area: districts, city	Official statistics or GIS calculation	Size of the city Map visualization is recommended
Population density: districts, city	Derived	Population distribution in the city or cross comparison between different cities Map visualization is recommended
Public transport history		
Key milestones: e.g., introduction of PT, end of tram, expansion of railway station, begin of DRT, …	City or operator’s information page or archive	Qualitative understanding of the overall development trend and speed of PT in the study area

Analysis/Statistics	Data collection/computation	Contribution to insights on
Fleet statistics		
Fleet composition by fuel type: diesel, natural gas, electricity	Operator's record	Energy sustainability of the fleet
Fleet capacity summary statistics	Operator's record	Supply capacity of the PT system
Fleet age summary statistics	Operator's record	Remaining service life of the PT fleet
Operational statistics		
Number of lines by mode	Operator's record/count	PT network size by mode
Length of lines by mode	Operator's record/GIS	PT network range by mode
Average turn-around time	Operator's record/timetable	PT operating frequency
Average operating speed	Operator's record, or derived from length and timetable	PT operating efficiency and safety
Number of departures per working day, Saturday, Sunday and holiday	Operator's record	PT service frequency
Annual KM: sum and per line	Operator's record	Scale of the PT operation in the city
Population/line	Derived	Utilisation rate of PT infrastructures from the demographics point of view
Population density/line	Derived	
Population/daily KM	Derived	
Population/departure per day	Derived	
Population density/departure per day	Derived	
Demand-side statistics		
Annual ridership in the past 5 years	Operator's record: smartcard/ ticketing information, or estimations	1. General PT system usage 2. Influence of events, such as pandemic
Monthly ridership in the past 12 months	Operator's record: smartcard/ ticketing information, or estimations	Seasonal trend: e.g., most cities have lower PT ridership during the summer vacations. However, touristic areas may have higher ridership in the summer
Hourly ridership on a typical working day	Operator's record: smartcard/ ticketing information, or estimations	Peak hours

Analysis/Statistics	Data collection/computation	Contribution to insights on
Average PT trips per person per year	Derived	Actual utilization rate of PT infrastructures and services based on ridership data
Average PT ridership per departure	Derived	
Daily ridership/population density	Derived	
Daily ridership/fleet capacity	Derived	
Annual ridership/annual KM	Derived	
Annual ridership/total line length	Derived	
Annual ridership/fleet size	Derived	
Financial statistics		
Annual cost in the past 5 years (all cost)	Operator's financial record	Trend of expenditure
Annual revenue in the past 5 years (excluding subsidy)	Operator's financial record	Trend of revenue if not considering government subsidies, since most PT systems are not profitable
Cost breakdown in the past year: staff, operation, others	Operator's financial record	General structure of spending
Revenue breakdown in the past year: ticket, pass, subsidy	Operator's financial record	1. General structure of income 2. Percentage of subsidy required to breakeven
Cost per KM	Derived	Unit expenditure and profitability correlated with the actual intensity of PT operation
Cost per passenger	Derived	
Revenue per KM (excluding subsidy)	Derived	
Revenue per passenger (excluding subsidy)	Derived	
Planning process		
List of planning processes	Refer to OPTI-UP Deliverable 1.1.1[1] Section 5 for standard planning processes	Key stakeholders and their competence areas in terms of PT systems and planning
List of stakeholders	Refer to OPTI-UP Deliverable 1.1.1 Section 5 for general categories of	

1 OPTI-UP (2024) "Comprehensive data report on existing public transport networks and best practices". https://www.interreg-central.eu/news/opti-up-project-achieves-milestone-with-completion-of-two-deliverables/

Analysis/Statistics	Data collection/computation	Contribution to insights on
	stakeholders. Requires local knowledge to define specific stakeholders.	
Participation of stakeholder in each process	Stakeholder interviews/exchanges.	

2. Alignment with Policy Frameworks

The goals and measures defined within a LPTP should not be developed in isolation. Instead, they must align with the broader strategic objectives established at European, national, regional, and local levels. For small and medium-sized cities, this alignment is especially important: it ensures consistency with overarching policy directions, facilitates access to funding and technical support, and enhances the strategic coherence of local actions.

Moreover, it is important to consider the relevant local sectoral plans and strategies to ensure coherent, holistic urban development, avoiding cross-sector misalignments and implementation bottlenecks.

2.1. Vertical alignment: Higher Level Mobility Policies

A comprehensive understanding of these higher-level frameworks allows cities to build their local strategies on a robust foundation, ensuring that local choices actively contribute to shared goals such as climate neutrality, improved public health, digitalization, and social equity in transport systems.

At the European level, the main objectives for urban mobility development are set out in two key policy documents:

- The Sustainable and Smart Mobility Strategy (9 December 2020), and
- The New EU Urban Mobility Framework, supported by the European Parliament resolution of 9 May 2023.

The Sustainable and Smart Mobility Strategy outlines a long-term vision to make the European transport system more sustainable, smart, and resilient. It promotes the shift toward low- and zero-emission mobility solutions, the digital transformation of transport, and the development of efficient multimodal networks.

The New EU Urban Mobility Framework, complemented by the 2023 resolution, focuses on the specific challenges and opportunities in urban contexts. It emphasizes reducing traffic congestion, improving air quality, ensuring inclusive mobility services, and better integrating urban mobility into broader transport networks.

These objectives aim to support the creation of efficient, safe, and accessible urban transport systems that align with the European Union's environmental and social goals, while also strengthening territorial cohesion.

While these European-level strategies provide a common reference point for all cities, the policy and planning documents at national, regional, and local levels are highly context-specific. Each city applying this methodology is therefore encouraged to conduct a dedicated review of its relevant frameworks to identify synergies, obligations, and strategic directions that should inform the local public transport plan.

By embedding the local strategy within this multi-level policy architecture, cities can ensure their actions are relevant, well-integrated, and future-oriented, paving the way for more coherent and impactful mobility transitions across Europe.

Goals list from European Strategies

The goals outlined below are drawn from the two mentioned documents for urban mobility at the EU level. They are presented here in thematic clusters to provide a structured and accessible overview of the priorities promoted by European institutions.

These thematic areas include:

- Accessibility, Inclusion and Equity,
- Sustainable and Collective Mobility,
- Multimodality and Network Integration,
- Environmental Impact and Urban Quality of Life,
- Digitalization, Innovation and Data Management,
- Governance, Regulation and Capacity Building.

This categorization is intended to help local authorities, especially in small and medium-sized cities, understand and align with EU-level strategies while tailoring them to their local context.

1. Accessibility, Inclusion and Equity

- Develop safe, accessible, inclusive, affordable, smart, resilient, and sustainable urban transport systems.
- Make cities more accessible and inclusive.
- Address transport poverty and inequalities in access to transport networks, especially ensuring connectivity between rural, peri-urban, and urban areas.
- Guarantee equal importance to all users in the planning process, with a diverse range of sustainable and smart mobility options.

- Ensure that urban areas remain accessible to all, avoiding discrimination and minimizing negative impacts on lower-income populations and peri-urban or rural residents.

2. Quality and Efficiency of Collective Transport

- Provide collective transport that is accessible, affordable, inclusive, and high-quality, with convenient door-to-door services.
- Invest in a modernized, expanded, interoperable and accessible collective transport network, through participatory planning.
- Emphasize the role of regional and suburban trains and ensure reliability and frequency for daily commuting.
- Support the shift towards collective transport and increase its modal share, also for freight.

3. Multimodality and Integration

- Strengthen intermodal mobility to connect people to jobs, education, and services.
- Support multimodal solutions (collective transport, rail, micromobility, etc.) in urban investment planning.
- Promote integration of Sustainable Urban Mobility Plans (SUMP) with territorial and urban planning and incentivize inter-municipal coordination.
- Ensure better complementarity between public and private transport services.

4. Digitalization, Data, and Smart Mobility

- Use artificial intelligence (AI) and digitization to improve transport system efficiency (vehicles, traffic, services, Intelligent Transportation Systems (ITS)).
- Install ITS infrastructure on critical roads and accident-prone segments.
- Support the development of smart mobility technologies and business models through a supportive legal and policy framework.
- Promote skills development, retraining, and research in smart mobility.
- Facilitate the creation of a European common data space for transport and promote data sharing.
- Support real-time traffic data interoperability across the EU.
- Promote digital multimodal mobility services (e.g. MaaS), smart ticketing, and integrated travel planning platforms.

5. Environmental Sustainability

- Reduce congestion, air and noise pollution through low-emission zones, emission stickers, traffic planning, and targeted delivery windows.

- Encourage local noise mitigation initiatives, such as acoustic radars.
- Provide charging infrastructure for electric bikes and cargo bikes and integrate alternative fuel infrastructure into multimodal hubs.
- Support the rapid deployment of green, integrated, user-centred mobility for people and goods.

6. Infrastructure and Land Use

- Encourage intelligent parking management ("Park and Ride" (P+R), "Kiss and Ride", secure bike parking).
- Use disused rail/public transport spaces for community-benefiting activities.
- Promote physical integration of different modes through well-designed nodes and terminals.

In addition to the EU policy framework, each city seeking to implement this strategy should conduct a context-specific review of mobility-related policies and regulations at the national, regional, and provincial levels.

2.2. Horizontal Alignment: Local Cross-Sectoral Policies

Furthermore, cities should identify, within their specific context, the most relevant cross-sectoral plans and analyse their objectives. Chief among these are spatial/territorial development plans (spatial planning and land-use plans).

Integrating public transport planning with spatial planning at the local level requires a stepwise approach. First, **an analysis of existing spatial plans is necessary to understand the current urban structure, land use distribution, and planned developments**. In parallel, it is important to **analyse the role of stakeholders** involved in spatial planning, since their priorities often shape mobility needs and opportunities. These two steps help to identify whether, and to what extent, public transport and spatial planning are interconnected.

To move beyond a descriptive assessment, LUTI models provide valuable tools. They allow planners to simulate how changes in land use influence mobility patterns, and conversely, how improvements in transport networks affect spatial development.

By incorporating LUTI models, local authorities can evaluate scenarios, anticipate long-term impacts, and design strategies that foster sustainable urban growth supported by efficient public transport systems.

3. User satisfaction and opinion on public transport in the coverage area

Public transport plays a very important role in the daily lives of citizens, influencing mobility, accessibility and overall quality of life. **To ensure that the transportation**

system in cities meets the needs of its users, it is useful to conduct surveys, which can be done in a variety of ways, creating an online questionnaire for example, to gather valuable feedback directly from citizens and all public transport users.

In addition to online questionnaires, other types of surveys can be conducted to reach a broader audience and collect more diverse feedback. These may include telephone interviews, face-to-face surveying in public spaces, distributing leaflets or paper questionnaires in public transport vehicles or at city administration premises, as well as promotional campaigns on local radio stations and similar channels.

Using a mix of these methods increases the chances of engaging different population groups and ensures more representative results. The purpose of these surveys is to provide an overview of the current level of satisfaction among citizens with respect to various aspects of the PT system. In particular, they seek to capture perceptions regarding the overall coverage of the transport network in relation to the city, the reliability of timetables, the capacity and cleanliness of vehicles, as well as to identify potential areas for improvement. Furthermore, the surveys are intended to shed light on citizens' emerging needs and to highlight possible service gaps, such as increasing the number of journeys, introducing new routes, or promoting multimodal public transport solutions.

It is important to emphasize, however, that the surveys presented – or any similar ones that may be proposed – rarely have scientific validity. This is due to their limited scope in terms of the depth and detail of the questions posed to stakeholders, as well as to the fact that the number of responses collected may at times be neither sufficiently representative nor exhaustive. As a result, the findings should be interpreted as indicative trends or useful insights for discussion and decision-making, rather than as definitive or scientifically robust evidence.

Users' input can serve Transportation operators as well as the Public Administration or Municipalities, Regions that manage public transportation, as a basis for future improvements and to create a PT system that is more efficient, comfortable, accessible for all, and considers the real needs of citizens.

The survey that will be conducted should be written in the local language of one's city and additionally, if desired, in English in those metropolitan cities where the presence of foreign students or workers is high.

The distribution channels of the survey can be different: through the city's website, the public transport operator, or through advertising on the vehicles themselves, in university centres, and so on.

Interested users should have at least two weeks to respond/complete the survey. Surveys constructed with a few clear, well-constructed questions have more chances to be filled out by a larger number of users.

The degree of satisfaction resulting from the survey will be a good indicator of the state of public transportation in the city and can also be considered a good indicator for future stages of implementation or changes in local public transportation.

The survey should also include questions that capture insights into travel habits according to the following metrics, which are useful for further modelling and for shaping the PT system:

- Travel frequency on working days vs. non-working days,
- Purpose of trips and frequency of trips by purpose,
- Time when the respondent needs to arrive at work/school,
- Time when the respondent usually leaves work/school,
- Improvements in PT that would encourage them to use it more frequently.

All results, especially regarding the planned use of the service, should be interpreted with caution. In other words, it should not be expected that all respondents who indicated future use of the service will use it. On average, it is reasonable to assume that 50% of such respondents will use the service.

The following table (Table 2) presents an example of survey on local public transportation. The questions included in this survey have been tested by the six pilot cities involved in the OPTI-UP project, with results that were useful for the continuation of the project. While it is acknowledged that this survey does not have a scientific value, as explained above, it is nevertheless considered sufficient for the development of local public transport plans for the six cities, partly because during this development local stakeholders are invited to participate in consultation meetings and study visits. These surveys also serve as a point of contact with PT users and make them feel involved in the changes or additions proposed by them.

Table 2 Possible questions for a survey on local public transportation [Source: OPTI-UP project team]

How often do you use Public Transport?					
	Rarely (less than once per week)	Sometimes (1-2 times per week)	Often (3-5 times per week)	Every day	Not related to me
For work					
For school/university					
For shopping and personal issues (doctor, bank, etc.)					
For leisure (cinema, restaurants, meet friends, etc.)					

Which mode of transport do you use most often?								
	Bus	Tram	Train	Trolley bus	Walk / Bicycle	Car - driver or passenger	Demand Responsive Transport (DRT)	Combination of modes
For work								
For school/university								
For other trips								

Grade the satisfaction with the following characteristics about the public transport					
	Very low	Low	Medium	High	Very high
Price					
Frequency					
Reliability					
Punctuality					
Availability of information					
Cleanliness					
Safety					
Occupancy					
Simplicity of the system network					
Integrated tickets					
Environmental sustainability					

Grade the importance of the following characteristics about the public transport					
	Very low	Low	Medium	High	Very high
Price					
Frequency					
Reliability					
Punctuality					
Availability of information					
Cleanliness					
Safety					
Occupancy					
Simplicity of the system network					
Integrated tickets					

Environmental sustainability					
Rate your satisfaction with the public transportation you use most frequently?					
Very low	Low	Medium	High	Very high	
What would you suggest to improve the public transport? (max 3)					
Increase the number of lines					
Increase the number of rides					
Make more stops					
Put timetable poles where there are none					
Clean and sanitize the transportation facilities better					
Ticket price					
Improvement of network organization					
More alternative fuel vehicles and similar					
Other					
What improvements would you suggest that were not mentioned in the previous question?					

4. Best Practices

Best practices, or the most effective and innovative project experiences, serve as valuable models for similar initiatives. They can spark innovative ideas and approaches, fostering innovation and continuous improvement across different cities and contexts.

By offering concrete solutions that have already proven effective elsewhere, best practices help other projects avoid common pitfalls, streamline efforts, and make better use of available resources. They also support capacity building by facilitating the transfer of skills and knowledge across European initiatives, enhancing collaboration and mutual learning among stakeholders. Moreover, integrating best practices contributes to raising the overall quality of European projects, as these practices are grounded in evidence-based results and real-world success stories.

In short, best practices are a strategic asset for European cooperation: they promote effectiveness, efficiency, innovation, and quality, ultimately accelerating progress toward shared goals.

In line with these premises, it should also be emphasised that such examples of Best Practice can be used not only by those involved in European projects but also by public administration technicians at various levels, whether national or even local.

Below is a possible model for collecting examples of best practices, which has been applied in the OPTI-UP project (Table 3). It is structured in three sections:

- Section 1 General Information,
- Section 2 Description of the Best Practice,
- Section 3 Main lessons learned and recommendations.

Table 3 Template for collecting best practices [Source: OPTI-UP project team]

1 General information about the Best Practice
Name/Title of Best Practice:
Name of the city/area in which the Best Practice was/is being implemented:
Number of inhabitants of the city/area that are involved/affected by the Best Practice:
Country:
City/Region/Canton/Land/County/Country… (if applicable):
Indicate the timeframe that was necessary for the implementation of Best Practice (if it was implemented)
Project Partner's name and number:
2 Description of the Best Practice
Please describe the main aspects of Best Practice (its scope, its implementation, its key features).
In which project pilot action(s) does this Best Practice work?
Please elaborate on the themes of the project pilot actions: xxx, xxx, xxx, etc... (a Best Practice can, of course, work on only one of the themes or on several themes).
How is this Best Practice linked to your pilot action?
Which types of Stakeholders (City administration for spatial planning, public transport authority, public transport operators, Business associations (e.g. Chamber of Commerce), NGOs, etc..) have been involved in this best practice?
Has this Best Practice been implemented in any city/area in practice (1) or is it only defined at a conceptual level during a research project (2)? If yes, describe where and how it works.
Do you Know if and which Transport model was used in this Best Practice (4-step model, LUTI, other)? Specify and explain if the model chosen had any problem.
3 Main lessons learnt and main recommendations
What were the main challenges encountered while implementing Best Practice?
What did not work well in this Best Practice, and what improvement potential would you suggest gaining better results?
What were the main lessons learnt from Best Practice and its implementation?
What is the main message that you derive from this Best Practice, the main success story that led you to select it?
What are the main recommendations from this Best Practices that you wish to communicate to the other pilot area in this project?

Any further notes on this Best Practice?
Web links to the Best Practice (if any):

In addition, **best practice analysis can provide indicators that allow forecasting the potential impact of certain measures** in a local context. For example, if a city has reorganized its PT network by simplifying the route structure and increasing service frequency, and this reorganization has resulted in a measurable increase in ridership, it is reasonable to assume that a similar measure would have a positive effect in another city with comparable transport, demographic, or urban characteristics.

Transport impacts can also be explained using tools such as price and time demand elasticities, as well as through the analysis of interdependencies between variables. For instance, the effect of service frequency on average waiting time, or the effect of reduced travel time on the competitiveness of PT compared to private cars. In this way, a best practice is not only a descriptive account of a successfully implemented measure but also an analytical instrument that enables the transferability of results to different local contexts. Ultimately, this approach increases the predictability of outcomes, reduces risks in decision-making, and enables cities to set realistic and measurable goals for improving their public transport systems, based on the proven experiences of others.

5. SWOT analysis

The SWOT analysis is a strategic tool that helps small and medium-sized cities assess their current PT landscape and develop a forward-looking plan for improvement. This methodology enables cities to systematically evaluate their transport systems from economic, environmental, and social perspectives, ensuring a balanced and sustainable approach to future development.

Cities should conduct their SWOT analysis by engaging key stakeholders such as transport authorities, urban planners, citizens, and businesses, to ensure a comprehensive and inclusive assessment. The analysis should be data-driven, incorporating transport usage statistics, demographic trends, and economic indicators to provide a realistic picture of the current situation.

In addition to quantitative data, the SWOT should also integrate qualitative insights derived from the review of relevant supra-local plans and policies, citizens’ perceptions collected through surveys, and the analysis of best practices and successful case studies. **This combination of sources helps identify both context-specific challenges and transferable opportunities, supporting small and medium-sized cities in developing tailored and actionable local mobility and spatial planning strategies.**

Once the SWOT analysis is completed, cities can use the findings to formulate strategic actions. For instance, strengths can be leveraged to address weaknesses, and opportunities can be pursued to mitigate threats.

The goal is to create a resilient, accessible, and sustainable PT system that meets the evolving needs of residents while aligning with broader urban development goals.

By systematically applying the SWOT methodology, cities can enhance their transport planning efforts, ensuring that their public transport systems are not only effective but also adaptable to future challenges and opportunities.

The SWOT Framework

- **Strengths**: These are internal factors that provide an advantage to the city's transport system. They may include well-established transport infrastructure, efficient public transport services, integration with other mobility solutions, strong political commitment, or favourable geographic conditions. Identifying these strengths allows cities to leverage them in their strategic planning.
- **Weaknesses**: These represent internal challenges that hinder the efficiency and effectiveness of public transport. Common weaknesses may include outdated infrastructure, lack of funding, low service coverage, poor accessibility for people with disabilities, limited digital integration or lack of integration between spatial and transport planning. Recognizing these limitations help in formulating strategies to overcome them.
- **Opportunities**: These are external factors that cities can capitalize on to improve their transport system. Opportunities may arise from technological advancements (such as smart mobility solutions and electric buses), national and European funding programs, shifting societal attitudes toward sustainable transport, or emerging trends like MaaS. Identifying opportunities helps in positioning the transport system for future growth and resilience.
- **Threats**: These are external risks that could negatively impact the city's transport development. They may include economic downturns affecting investment capacity, regulatory changes, environmental constraints, competition from private car usage, or demographic shifts leading to changes in demand. Understanding potential threats allows cities to develop mitigation strategies and build a more robust transport system.

Table 4 shows an example of a SWOT analysis carried out by the city of Grosuplje for the development of a LPTP within the OPTI-UP project.

Table 4 Example of a SWOT analysis for the city of Grosuplje [Source: OPTI-UP project team]

Strengths (S)
Lower congestion compared to large cities allows for more reliable scheduling.
Services like schools, sports facilities, shopping centres, public offices and transfer points to the regional public transport services are few and concentrated, making route planning easier.
PT occupancy shows distinctive bottoms and peaks and makes it easier to identify time windows for planning different forms of PT services.

Grosuplje municipality has a mass transit connection to the regional centre of Ljubljana by train.
Existing infrastructure (roads, stop shelters) and availability of vehicles is sufficient for connectivity needs within the municipality of Grosuplje.
National PT Authority (*Družba za upravljanje javnega potniškega prometa*, DUJPP) manages efficiency of PT services and supports projects for better and efficient connectivity.
The PT operator already has capacities to provide DRT instruments (call centre, smaller electrical vehicles).
Use of electric vehicles for DRT services intended to transport elderly people (1 "Zapeljivček" car operated in the city centre and 2 "Grosupeljčan" cars for the wider municipality transportation).
A secure bike storage shed at the location of Grosuplje bus and railway stations.
A large multimodal information display at the location of Grosuplje bus and railway stations where local and regional PT services are displayed to support multimodality.
A P+R garage at the location of Grosuplje bus and railway stations for boosting use of regional PT railway and bus services.
Weaknesses (W)
Dependence on private cars due to cultural habits and insufficient offer of PT services.
Scattered settlements in the municipality hinder efficiency of PT network layout and frequency.
Congested roads from the Grosuplje to the Ljubljana employment/study destination at the peak hours and only a single-track railway connection from Grosuplje to Ljubljana.
Lower ridership levels, except for school intended service, make it harder to sustain frequent services.
Limited availability of weekend services.
Insufficient bus stops in new growing settlements in the municipality.
Poor integration with regional railway and bus transport to Ljubljana.
Operation of large 50-seater buses on low-occupied departures causes air pollution and energy and cost inefficiency due to low vehicle occupancy.
Opportunities (O)
Potential for strong community engagement and feedback integration; the municipality, PT operator, the national PT Authority (DUJPP) and the Ministry are supportive of PT improvement initiatives and projects.
Local, regional and national legislations support deployment new forms of PT to encourage better use of public transport.
Introduction of eco-friendly solutions electric buses.
Introduction of micromobility (bike sharing to support PT use).
Existing national transport model can be updated and finetuned for analysis and simulation of scenarios in the municipality of Grosuplje.
Participation in the Ljubljana Urban Region transport initiatives.

Support of EU funded projects and pilot activities for sustainable mobility solutions.
Development of bicycle network within the scattered settlements and connection roads to the municipality centre to incentivise alternative to the car transport.
Growing demand for alternative transport modes (e.g., carpooling, on-demand minibuses) in the areas without PT connectivity – usually only served by school transport service.
Collaboration with local schools and pension organisations to better understand needs for PT.
Development of smart mobility apps for real-time information, route optimization and DRT support, connecting municipality and regional transport services.
Demographic challenges – aging population might need more PT service.
Inclusion of private transport services (like Flixbus) to PT offer (by accepting PT tickets and negotiating financial clearing).
Threats (T)
Limited financial resources to upgrade single railway track to the double-track, which would allow higher capacity and shorter travel times (opposite direction train crossing) between Grosuplje and Ljubljana.
Shortage of drivers with D-category driver license – difficult planning of drivers' shift.
New forms of PT are rather subject to EU projects than strategic planning within the municipality
Demographic challenges – aging population might need more attention when introducing new info mobility services (ticket vending machines, P+R parking use, mobility apps…).
Resistance to change from local policymakers or residents (e.g. persistent use of private vehicles).
Economic downturns that could reduce public funding.

The presented example can be used as a basis for considering the SWOT status of any area where public transport improvements are planned.

6. Vision and Local Goals

A milestone of a LPTP is the definition of a long-term vision and specific goals for sustainable PT systems and spatial planning. When a city intends to develop a LPTP, after analysing the current context, summarized in the SWOT analysis from the previous chapter; it must proceed to define its vision and goals.

The vision represents the overarching, long-term aspiration for the evolution of the local transport system. It provides a unifying direction that guides decision-making and serves as a reference point for all subsequent planning choices. Defining a clear and shared vision helps ensure coherence in the strategy, aligning individual measures with a broader transformative goal.

The goals translate this vision into concrete ambitions, outlining what the LPTP aims to achieve through its intervention measures. These goals encompass mobility, social, economic, and environmental aspects. The integration of goals referring to different dimensions is a crucial moment in the planning process, as it is often necessary to pursue conflicting goals simultaneously.

It is important that the goals set by a LPTP align with the regulatory and planning framework at higher levels (regional, national, European) while remaining specific to the local context. Defining and sharing goals with the public improves transparency in the decision-making process and helps citizens understand how intervention measures fit into a well-structured strategic framework.

However, while a well-defined vision and goals provide essential guidance, planning must also account for operational realities. Transport agencies often need to respond to immediate contingencies, limiting the extent to which long-term strategies can be fully implemented as originally conceived. This dynamic nature of public transport management means that strategic plans must be both aspirational and adaptable, ensuring resilience in the face of evolving challenges and opportunities.

Public transport planning also needs to consider spatial plans to consider future requirements for PT. Of course, it should be made vice versa, when developing spatial plans, to consider PT requirements. For example, if city wants to develop new district, it should plan that roads should have bus stops, and/or tram stops, etc. and how will it be connected. If district is built and then PT is started to be planned, there will be issues with building and planning of new stops, turnarounds for buses, etc.

This strategy suggests a list of general goals that medium- or small-sized cities can adopt when developing a local public transport plan. The proposed list is based on an analysis of existing planning tools and the practical experience gained through the OPTI-UP project with six pilot cities. This list (Table 5) serves as a starting point for reflection: each city can select the most relevant goals for its specific context or expand upon them by introducing additional, tailored objectives that reflect its unique characteristics.

Table 5 Goals emerged as the most common during the interactions and co-design process carried out throughout the OPTI-UP project with the six partner cities [Source: OPTI-UP project team]

Mobility aspects
Improve the territorial coverage of the TPL service
Enhance passenger comfort on public transport
Increase the frequency of TPL services
Improve the punctuality of TPL operations
Promote multimodal integration
Optimize route planning
Improve information for passengers
Spatial Planning aspects
Define land use allocation

Improve environmental protection
Adapt urban density
Redefine public spaces and amenities
Economic aspects
Improve efficiency to provide better service at the same cost
Reduce fuel expenses
Decrease administrative costs
Encourage public-private partnerships for investment
Environmental aspects
Reduce air pollutant emissions
Lower noise pollution
Decrease energy consumption
Social aspects
Incorporate commuter needs into planning
Provide an extensive service to ensure mobility for people without alternatives
Improve safety
Enhance accessibility for people with disabilities and reduced mobility

Goals coherence analysis

An essential step in the development of a robust and credible local public transport plan is the verification of coherence between the goals defined at the local level and those established at higher levels of governance.

Ensuring such alignment strengthens the strategic value of the plan, demonstrating that local actions are not isolated or improvised, but embedded within a broader, shared policy framework. This is particularly relevant in the context of access to funding, policy consistency, and coordination with other public initiatives.

The coherence check helps validate that local objectives respond to common challenges such as decarbonisation, digitalisation, accessibility, and economic resilience. Importantly, this verification is based on a qualitative assessment, expressed through a simple scale that identifies the level of alignment as **strong coherence**, **coherence**, or **weak coherence**. This approach allows planners to systematically evaluate the integration of local priorities within wider European, national, and regional strategies.

7. Actions

This chapter provides a structured outline of possible actions that cities may consider when working to achieve their vision and goals for public transport. **These actions should be informed by the outcomes of a SWOT analysis and developed through a participatory process that engages technical experts, spatial planners, political representatives, citizens, and other relevant stakeholders.**

At this stage, actions are presented in a general and strategic form, serving as an **initial list of intervention measures that address identified needs and opportunities**. They should reflect the ambitions of the city in enhancing its public transport system, without yet going into full technical or financial detail.

It is important to emphasize that such actions are not final. Cities are encouraged to subject them to validation processes that include scenario-based assessments and modelling tools. These methods help refine proposed actions, add necessary detail, and establish a clear hierarchy of priorities based on impact, feasibility, and alignment with the overall strategy. In this way, the preliminary list of actions becomes a robust foundation for informed decision-making in the subsequent stages of PT planning.

The following section presents a thematic list of possible lines of action that cities can use as inspiration when defining their own intervention measures. The actions stem from the vision, strategic goals, and SWOT findings, and are organized by thematic areas to facilitate structured dialogue with technical staff, decision-makers, citizens, and stakeholders.

While the first three thematic areas are more directly related to transport-specific issues (as highlighted in the OPTI-UP project), the remaining areas are cross-cutting, addressing broader urban development challenges and opportunities that often intersect with transport policy.

Measures identified at this stage can later be assessed, refined, and prioritized using modelling tools and scenario-building exercises, ensuring that cities design action plans that are practical, effective, and context-sensitive.

1. Public Transport in Low-Density Areas

- **Creation of DRT services:** Implement flexible transport options using appropriate capacity vehicles that respond in real time to user needs, improving coverage in lower demand for public transport.
- **Public-private partnerships:** Engage with local private operators to expand transport availability in rural and peripheral areas.
- **Flexible scheduling models**: Introduce semi-flexible routes where buses follow a fixed trunk line but adapt detours based on real-time bookings.

- **Community-based transport cooperatives**: Support locally managed minibus or shuttle services where municipalities partner with residents.
- **Micro-mobility integration**: Complement DRT services with shared bikes or e-scooters to cover the “last mile” in sparsely populated areas.
- **On-demand school and healthcare transport**: Tailor services to specific needs such as student transport or access to hospitals and clinics.

2. Network Optimization and Multimodality

- **Restructuring of existing routes:** Optimize the transport network by eliminating overlaps and redundancies, improving connectivity between central and outlying areas. Optimization should consider both operational and financial indicators.
- **Implementation of a multimodal transport system:** Set up foundations to integrate various modes (tram, bus, train, bike, etc.) into a coherent, user-friendly network accessible through a single digital platform.
- **Development of intermodal hubs:** Build exchange hubs to facilitate smooth transitions between different transport modes, enhancing accessibility and travel efficiency.
- **Feeder services:** Develop feeder bus lines connecting smaller neighbourhoods to main transit corridors and hubs.
- **Unified scheduling:** Coordinate timetables between different transport modes to reduce waiting times and ensure smooth connections.
- **Priority lanes and corridors:** Introduce dedicated bus/tram lanes to speed up services and ensure reliability.
- **P+R systems:** Build facilities near main transit corridors to reduce car dependence and encourage multimodal trips.

3. Energy Efficiency and Sustainability

- **Electrification of the public transport fleet:** Transition from fossil fuel vehicles to electric or low-emission alternatives such as electric buses or solar-powered trams.
- **Optimization of routes and travel times:** Use smart traffic and route management systems to minimize energy use and improve service performance.
- **Renewable energy infrastructure:** Install solar panels at depots, stops, and intermodal hubs to support the charging of electric fleets.
- **Eco-driving programs:** Train drivers in energy-efficient driving techniques supported by telematics.
- **Lifecycle fleet management:** Plan procurement and disposal of vehicles based on circular economy principles.

- **Carbon footprint monitoring:** Introduce systematic tracking of emissions reductions and publish annual sustainability reports.

4. Planning and Governance

- **Integration with broader urban policies:** Align transport planning with land use and spatial planning policies to support sustainable development in residential, commercial, and industrial areas.
- **Use of advanced mobility data:** Analyse real-time data on traffic and movement to better align services with actual demand.
- **Community participation in planning:** Actively involve citizens in the design of routes and services via surveys, workshops, and consultations.
- **Regional coordination frameworks:** Establish cross-municipal bodies to manage transport networks that go beyond city boundaries.
- **Performance-based contracts:** Define clear KPIs for operators linked to service quality, punctuality, and customer satisfaction.
- **Scenario-based planning:** Use predictive modelling to test different demographic or economic growth scenarios.
- **Knowledge exchange platforms:** Participate in European and national networks to share lessons learned and innovative approaches.

5. Transversal Measures

- **Education and awareness campaigns:** Inform and educate the public on the benefits of PT, sustainable mobility, and shared transport solutions.
- **Incentives for public transport use:** Provide discounts, tax benefits, or loyalty programs especially targeting users in low-density areas.
- **Disincentives for car users:** low emission zones, parking policies.
- **Resilient and climate-adaptive infrastructure:** Invest in infrastructure capable of withstanding extreme weather events and adapting to climate change impacts.
- **Employer mobility programs:** Partner with businesses to offer mobility packages (discounted passes, shuttles, carpooling platforms).
- **Accessibility improvements:** Ensure universal design principles in vehicles, stops, and ticketing systems.
- **Tourism-oriented mobility packages:** Offer combined tickets that integrate PT with cultural or recreational activities.
- **Funding and financing mechanisms:** Explore innovative financing (green bonds, congestion charging, EU funding opportunities).

6. Digitalization and Innovation

- **Smart ticketing and digital services:** Introduce integrated payment systems and mobile apps providing real-time updates and travel planning.
- **MaaS platforms:** Enable seamless integration of multiple transport modes in one digital tool for booking, payment, and information.
- **ITS:** Leverage big data, AI, and advanced technologies for efficient service management and planning.
- **Internal process digitalization:** Improve administrative and operational processes using digital tools for planning, monitoring, and maintenance.
- **AI-based demand prediction:** Use predictive analytics to adjust frequency and fleet deployment dynamically.
- **Open data ecosystems:** Make transport data publicly available to encourage third-party innovation and app development.
- **Digital twin models:** Simulate urban mobility scenarios digitally before implementation.
- **Cybersecurity measures:** Ensure data protection and system resilience against digital threats.

7. Communication and Transparency

- **Clear and accessible communication:** Ensure consistent, multilingual, and user-friendly information on services, schedules, and disruptions.
- **Targeted communication campaigns:** Develop messages tailored to specific user groups (e.g., seniors, students, commuters).
- **Transparency in decision-making:** Share data, criteria, and planning choices openly to foster trust and accountability.
- Promote public transport and alternative means of transport via the PT operator's website, by placing leaflets on PT, and by placing print or video advertisements in bus stations.
- **Real-time communication channels:** Provide push notifications and personalized updates on delays or disruptions.
- **Branding and identity strategies:** Develop a recognizable brand for the PT system to foster a sense of trust and loyalty.
- **Participatory transparency dashboards:** Publish interactive online dashboards with KPIs.
- **User ambassadors:** Engage community representatives to promote PT and act as a bridge between operators and citizens.

8. User Engagement and Co-Creation

- **Participatory service design:** Actively involve citizens in the design of routes, stops, and schedules through interactive tools, monthly/bi-monthly workshops, or gamification methods.
- **Continuous user feedback systems:** Collect structured feedback and suggestions via digital tools, public meetings, or user panels.
- **Inclusive engagement practices:** Ensure the involvement of vulnerable or underrepresented groups (e.g. people with disabilities, peripheral residents, youth) in the planning process.
- **Living labs:** Pilot new services in specific neighbourhoods with active citizen involvement before scaling up.
- **Gamification of feedback:** Reward users for providing feedback or participating in surveys.
- **User councils:** Establish permanent advisory boards including representatives of different user groups.
- **Participatory budgeting:** Allow citizens to vote on small-scale improvements (e.g., shelters, bike racks, benches) financed through municipal budgets.

Table 6 Actions identified in the Local Public Transport Plan developed by the City of Osijek within the framework of the OPTI-UP project [Source: OPTI-UP Project team]

Action	Brief description
Introduce new bus lines in underserved areas	Connection between Retfala and Industrial zone Jablan (both in the City of Osijek) and other low-access neighbourhoods to improve equity and connectivity.
Bus route restructuring and optimization	Redesign existing routes based on demand, travel patterns, and performance data.
High-frequency bus corridors	Establish core corridors with high-frequency service (e.g., every 5-10 minutes).
Fleet electrification	Replace diesel buses with zero emission vehicles across the city.
Real-time tracking system	Implement GPS-based arrival tracking available via mobile app and station displays.
Mobility hub development	Build integrated hubs where buses, bike-sharing, car-sharing, railway system intersect
Marketing campaign to boost ridership	Launch a public awareness campaign emphasizing benefits of public transport.
Regional rail integration	Expand timetables and ticketing to coordinate with intercity trains.
Infrastructure upgrade program	Plan and execute 20+ targeted upgrades, including new tram and bus lines and station renovations.

8. Testing scenarios with Models

To support evidence-based decision-making and guide the prioritization of interventions, this methodology incorporates the use of transport and land use models; specifically, the classic four-step transport model, an example implementation of which is the PTV VISUM software[2]; and LUTI models, an example being the Metropolitan Activity Relocation Simulator (MARS) model[3]. **These tools allow cities to move beyond static, prescriptive planning toward a dynamic, scenario-based approach aligned with European best practices and SUMP guidelines.**

By simulating future mobility and land use conditions under varying assumptions, models enable local decision makers to assess the likely impacts of different policies or actions, such as new transit lines, fare adjustments, or urban development strategies, on accessibility, modal shift, environmental outcomes, and social equity.

In particular, they provide a robust framework to:

- Quantify the potential effects of planned actions and alternative configurations,
- Compare strategic development scenarios (e.g. business-as-usual, introducing DRT, restructuring existing routes, fleet electrification, etc., as introduced in Section 7),
- Understand the interdependencies between land use, mobility, and socio-economic trends,
- Identify priority actions based on measurable outcomes and long-term impacts.

During the creation of models in appropriate software, the first general task is to create the base models that realistically reflect current state of infrastructure, spatial development, population demographics and behaviours of the area, and include other relevant data that are available for calibration or increased detailedness. Incorporating accurate and up-to-date data in the model is an important aspect to ensure that the simulations based on the model would give trustworthy and appropriate results.

Furthermore, **model outputs,** wherever possible, **should be directly linked to the strategy's monitoring framework and key performance indicators, ensuring that simulations inform both planning and implementation phases.**

Incorporating these models transforms this strategy into a truly comprehensive planning tool, capable of not only guiding the drafting of LPTPs, but also testing, selecting, and adapting actions in response to evolving urban challenges.

With a ride range of choices of transport models ready to be implemented in real-world applications, it is important to understand their similarities and differences to choose an appropriate one. For example, by different spatial resolution, there are macroscopic,

2 PTV VISUM software: https://www.ptvgroup.com/en/products/ptv-visum

3 MARS model: https://www.tuwien.at/en/cee/transport/planning/services/mars

mesoscopic, microscopic models. By different temporal resolution, there exist static, quasi-static, or dynamic models. In addition, models may focus on a single mode of transport, or a multi-modal network. Different models also differ in how they handle supply-demand interactions: the traditional four-step models typically are trip-based, while more behaviourally realistic activity-based models consider a flexible daily chain of activities in the population.

Model selection depends on the problem's scope, data availability, and modelling tools. It is essential to recognize that the models available must often be adapted to local specificities. In many small- or medium-sized cities, challenges such as limited access to reliable input data, lack of appropriate software tools, insufficient in-house expertise, or budget constraints to hire external consultants may arise.

Therefore, modelling approaches should be flexible and proportionate to the local context, prioritizing simplicity and interpretability where needed. Tailored or simplified models, when well-calibrated and transparently documented, can still provide valuable support to decision-making, especially if combined with participatory validation processes involving technical staff and stakeholders. Although modelling might incur additional cost, it is an important tool which gives possibility to make data-driven decisions.

8.1. Base scenario calibration and alternative scenario mapping

A model-based analysis of transport policies begins with the definition of a calibrated **base scenario model**, followed by the development of several **alternative scenarios** to be tested. The base scenario, often referred to as the *business as usual (BAU)* scenario, represents the expected situation and outcomes if no additional policy interventions are implemented.

Building the base scenario requires accurate and up-to-date data on infrastructure, spatial development, transport operations, population behaviour, and related factors. In addition, **calibration data** from the real world are essential for validating the model outputs. Typical calibration data may include mode split ratios (for multi-modal models), passenger volumes on specific public transport lines (for PT-only models), and other observed indicators.

If the base model results deviate from the calibration data, parameter adjustments must be made until the differences fall within acceptable ranges. For example, in the OPTI-UP projects, the calibration of the multi-modal LUTI model MARS required that mode split differences remain within 1% across all modes of transport.

The mapping of alternative scenarios involves **iterative feedback sessions with local stakeholders**, building on the earlier *Vision and Local Goal identification* described in Section 6. Compared to real-world implementation, developing alternative scenarios within models is significantly more cost-effective, as additional scenarios can be incorporated at minimal expense. This flexibility allows for the testing of a wide range of scenarios, providing a solid evidence base for the action planning process that will be introduced in Section 10.

To support scenario mapping, the modeller should prepare a **structured template** that outlines key categories for discussion, such as short-term and long-term scenarios. This template can be used in different formats; for example, printed on large sheets of paper for in-person workshops, or shared through online collaboration tools (e.g., Miro boards) for virtual engagement.

The figure below illustrates a sample template. The **top row** represents short-term scenarios, while the **bottom row** represents long-term scenarios. The **columns** correspond to different modelling approaches: in this example, the first column shows the four-step model, and the second column presents the LUTI model. This template was populated at the initial stage of model development and revisited at each key milestones to refine and enhance the scenario definitions throughout the modelling exercises.

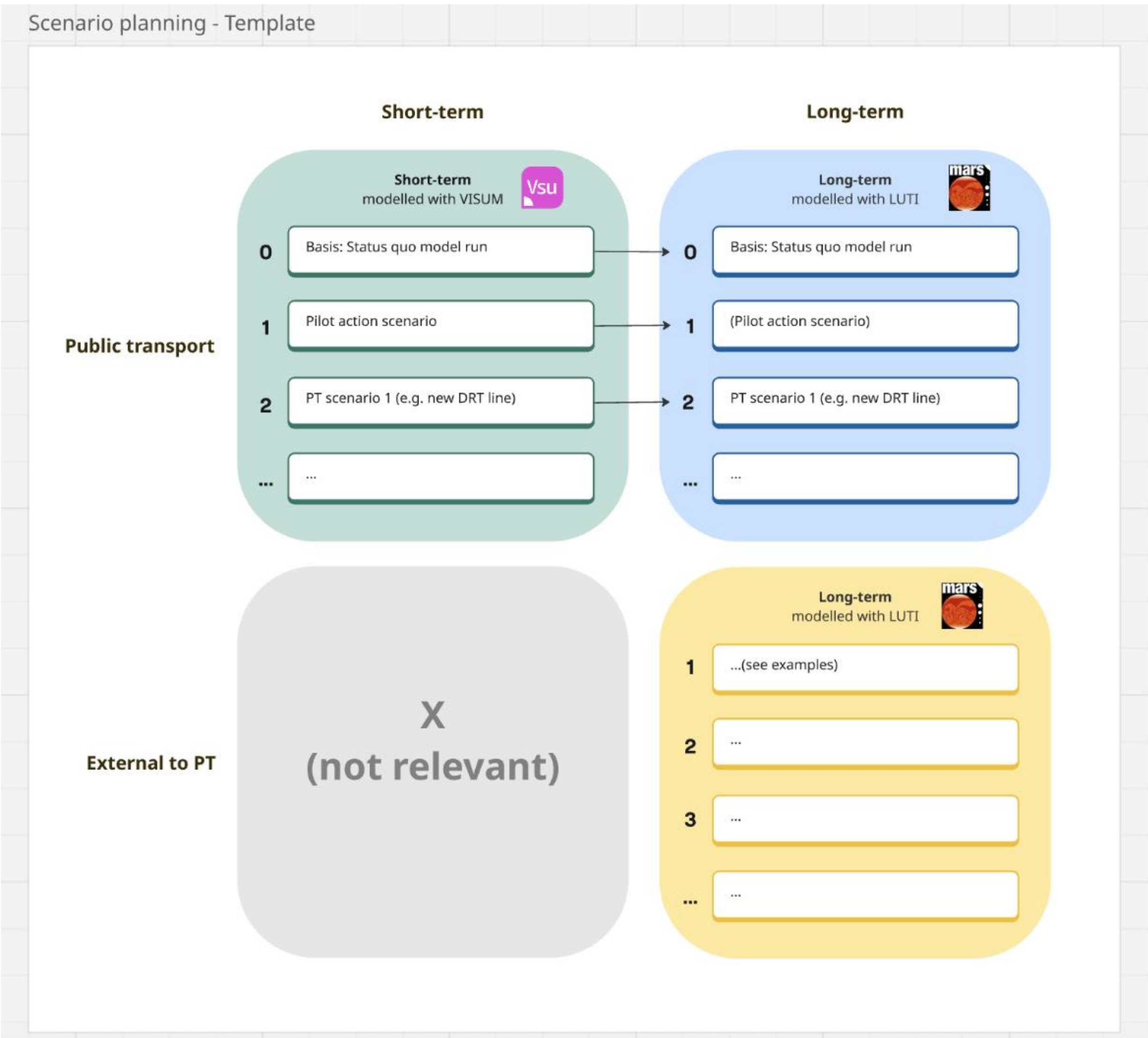

Figure 3 An example template for iterative scenario mapping, featuring the identification of short-term and long-term scenarios [Source: OPTI-UP project team]

8.2. Four-step model

The four-step modelling framework is widely adopted in transport planning, including PT, by sequentially forecasting the travel demand and assessing the performance of the transport systems at regional or city level. The four steps are:

1. **Trip generation** estimates the number of trips based on land use and demographics.
2. **Trip distribution** matches origins and destinations, often using gravity models.
3. **Mode choice** determines which modes are used between origin-destination (OD) pairs, typically via random utility models.
4. **Route assignment** allocates trips to specific routes, using optimisation algorithms to account for congestion effects.

The four-step framework is a comprehensive and structured approach to modelling transport systems, capturing multi-modal interactions and the feedback interactions between demand and supply. The methodology has been widely applied in research studies and for guiding policy strategy making in real-world projects. Various software tools, such as AIMSUN Next, PTV VISUM, EMME, are available to support its implementation.

It should also be noted that simplified four-step models can be developed specifically for local contexts using more accessible tools such as MS Excel, GIS applications, or open-source platforms, without the need for expensive proprietary software. However, regardless of the tool, specialist knowledge and experience in transport planning and public transport operations are essential to ensure the validity and usefulness of the results.

8.3. LUTI model

LUTI models offer a strategic and dynamic approach to understanding how land use and transport systems co-evolve over time. These models are particularly useful for exploring long-term urban development patterns and the impacts of transport policies on spatial behaviour.

The interactions between land use and transport components manifest in various ways, e.g., through the principle of a constant travel time budget, where improvements in public transport may encourage urban sprawl as people choose to live farther from city centres.

Despite their strengths in capturing high-level dynamics, LUTI models are sensitive to input assumptions, such as travel distances, and face challenges in representing land use change due to political and regulatory uncertainties. Their coarse spatial resolution also limits their applicability for detailed operational analysis. As such, they are best suited for strategic planning rather than detailed service optimization.

One example of such a model is MARS, which integrates a land-use sub-model with a transport sub-model based on System Dynamics principles[4]. Designed for strategic planning over horizons of 30 to 50 years, LUTI models like MARS typically use aggregated zones and annual time steps, allowing for efficient simulation and rapid scenario testing. These models have been applied in diverse urban contexts, including Vienna, Madrid, Bangkok, and Porto Alegre, to support policy analysis and participatory planning processes.

Example: Model Adaptation in Osijek

In Osijek, the OPTI-UP project built upon an existing PTV VISUM model originally developed for the city's Master Plan. Rather than creating a new model from scratch, the team updates and refines the existing model to reflect 2024 conditions, incorporating revised public transport routes, updated bus stops, and newly constructed roads. This served as the foundation for developing baseline models for scenario testing.

The process begins with capacity-building activities, including webinars and stakeholder engagement to enhance local understanding of transport modelling. A standardized engagement template is also used to track modelling-related tasks and knowledge level improvements.

For short-term policy analysis, the updated VISUM model is applied to simulate potential interventions defined collaboratively by modelling experts and local stakeholders. Given the strategic nature of Osijek's planned interventions, particularly their long-term, multimodal impacts, a LUTI model (MARS) is also developed to capture changes in land use and mode split over time.

The baseline models in both VISUM and MARS are calibrated using recent mobility survey data to ensure realistic baseline performance. Once validated, a scenario planning workshop is held to identify a range of testable scenarios, including both pilot-ready actions and exploratory policy options in the short and long term.

Due to limited in-house expertise, the technical modelling tasks are led by external consultants, while the municipality contributed data and helped validate results. This collaborative, resource-conscious approach enables Osijek to build robust models that support both short- and long-term transport planning.

9. Stakeholders

The process of local mobility planning, as well as the design of individual measures and projects, should involve stakeholders at every level, according to their respective competences. The selection of stakeholders depends on the theme to be developed at different level, considering the objectives of each Pilot City. Stakeholders related to PT

[4] Pfaffenbichler, P., Emberger, G., & Shepherd, S. (2010). A system dynamics approach to land use transport interaction modelling: The strategic model MARS and its application. System Dynamics Review, 26(3), 262-282. https://doi.org/10.1002/sdr.451

in Europe include a wide array of entities, encompassing public transit operators, authorities, regulatory bodies, and various organizations involved in research, development, and policymaking.

A more detailed list of possible stakeholders is:

1. Public Transit Operators:

- National and regional PT operators,
- Urban and suburban PT operators: e.g. operators of buses, trams, etc.

2. Public Authorities and Regulatory Bodies:

- National and regional transport ministries: Responsible for setting policy and regulation,
- European Union institutions: the European Commission, Parliament, and Council play a key role in setting up EU transport policy,
- Regulatory agencies: e.g. National/Regional or Local Public Transport authorities.

3. Organizations:

- UITP: the International Association of Public Transport, representing PT operators and authorities worldwide,
- Eurocities: a network of European cities working to improve public transport systems.

4. Research and Development:

- Universities and research institutions: engaged in research and innovation in areas like MaaS and sustainable transport,
- EU-funded projects: various research projects aimed at improving public transport systems.

5. Other Stakeholders:

- Local population and tourists: the primary users of PT,
- Environmental and advocacy groups: advocating for more sustainable and accessible PT,
- Industry suppliers: companies involved in the supply of vehicles, equipment, and services to PT operators.

10. Action Plan

The Action Plan represents the most operational component of a LPTP. While previous chapters focused on the analysis, strategic vision, and scenario testing, this chapter translates selected and validated actions into a concrete, time-bound implementation framework.

The Action Plan provides local authorities with a structured roadmap for executing the plan, allocating responsibilities and resources, and ensuring accountability throughout the process.

For each action identified in Chapter 7 and validated through modelling and scenario assessment in Chapter 8, the Action Plan should include the following components:

1. Resources

Each action requires specific resources for its implementation: financial, human, technical, and organizational. The Action Plan should estimate both implementation and maintenance costs and identify potential funding sources, including municipal budgets, national programs, EU funds, and private investments. It should also specify the technical and human capacities needed, outline staff roles, and assess whether external expertise or additional training is required.

2. Timeline

A clear and realistic timeline is essential to structure implementation. Each action should include defined start and end dates, intermediate steps or milestones, and deadlines. It is important to identify any interdependencies between actions, consider seasonal or regulatory constraints, and allow for some flexibility to accommodate unforeseen delays. Gantt charts or similar visual tools can help make the timeline more understandable.

3. Stakeholders

Effective implementation relies on the involvement of a wide range of actors, including public authorities, transport operators, civil society organizations, businesses, and users. The Action Plan should identify relevant stakeholders for each action and clarify their possible contributions, such as funding, coordination, technical support, communication, or monitoring. Forms of collaboration or co-design may be necessary depending on the type of intervention.

4. Expected Impacts

Each action should be linked to its anticipated direct and indirect outcomes. These may include improvements in service quality, accessibility, environmental sustainability, user satisfaction, or/and shifts in travel behavior. Impacts should be described qualitatively and, where possible, supported by quantitative indicators that are consistent with the monitoring framework. The effects should also be evaluated in terms of their alignment with the strategic objectives of the plan and their relevance for different user groups.

5. Risks and Mitigation Strategies

Actions may face various risks: technical, financial, political, or social. A basic risk assessment should be included for each action, highlighting major uncertainties and proposing mitigation or contingency measures. Using a risk matrix (based on probability and impact) can help prioritize actions requiring closer attention or additional safeguards.

6. Legal and Regulatory Requirements

Certain actions, especially those involving infrastructure or pricing measures, may require legal adjustments or administrative procedures. The plan should identify any legal constraints, as well as the authorizations, permits, or institutional decisions required for implementation.

7. Monitoring Indicators

Each action should be accompanied by a set of performance indicators to track its progress and effectiveness over time. These indicators should be measurable, relevant to the action's objectives, and aligned with the broader monitoring and evaluation framework. Responsibilities for data collection and reporting should also be clearly assigned (see Chapter 11).

8. Communication and Engagement Strategy

Public support is essential for successful implementation. The Action Plan should consider whether communication campaigns, consultations, or public information efforts are needed to facilitate user acceptance and reduce resistance. Special attention should be given to specific target groups, such as young people, older adults, or daily commuters, depending on the nature of the action.

All the above elements should be summarized in a structured format, such as an Action Plan Table (Table 7), to facilitate clarity and coordination across departments. This table becomes a reference document throughout implementation and monitoring phases.

Table 7 A template for compiling the information required for each action that will form part of the action plan [Source: OPTI-UP Project team]

Action	
Timeline	
Resources	
Stakeholders	
Impacts	
Risks & Mitigation	
Legal Requirements	
KPIs	
Communication	

11. Monitoring

Monitoring is a crucial stage in the implementation of any LPTP, as it allows progress to be assessed over time, challenges to be identified promptly and necessary changes to be made. To ensure its effectiveness, therefore, **monitoring should follow a structured**

approach, even if presented in a simple and schematic format. **A basic monitoring plan should clearly outline recurring deadlines, responsible actors, required tools, and relevant data sources.**

This framework should include a **defined schedule for data collection and reporting** on a quarterly, semi-annual, or annual basis, tailored to the scale of the actions and aligned with key decision-making moments. It must also **assign clear responsibilities** for each task, involving municipal departments, agencies, or external partners where appropriate, to guarantee continuity and accountability.

An essential component of the monitoring system is the **set of KPIs**, which will be presented in detail in the following section. These indicators provide measurable references to assess the effectiveness and efficiency of the planned actions and their alignment with strategic goals.

The plan should also **identify the tools and instruments needed for monitoring** such as mobility data platforms, GIS systems, survey instruments, or analytics software, and clarify what data are required, their sources (e.g., internal databases, national statistics, external providers), and how they will be managed.

By establishing a transparent, well-structured monitoring framework from the outset, cities can enhance the credibility of their plans and build a foundation for evidence-based adjustments and continuous improvement.

Identification of SMART KPIs

To effectively assess the impact of actions included in future LPTPs, it is essential to establish a structured monitoring framework based on measurable indicators. The **metrics** listed below represent a comprehensive set of quantitative and qualitative data that can be used to describe the performance and evolution of key aspects of local mobility systems, ranging from transport operations and environmental impact to user satisfaction and stakeholder engagement.

However, metrics are not, by themselves KPIs. A KPI is derived from tracking changes in specific metrics over time. This involves comparing its baseline value (before the implementation of actions), intermediate values (during implementation), and final values (at the end of the plan period). This time-based variation provides crucial information on whether progress is being made, the extent of the improvement, and how close the outcome is to the expected target.

An effective KPI allows decision-makers to:

- **Measure progress** toward strategic objectives,
- **Quantify the impact** of specific actions or interventions,
- **Identify gaps or setbacks** if observed values diverge from expected results,
- **Trigger corrective actions**, ensuring adaptive and responsive planning.

For example, a metric such as *"percentage of the population within 350 meters of a public transport stop"* can be turned into a KPI by comparing values before and after the reconfiguration of the PT network. If the baseline is 72% and it rises to 85% after implementation, the KPI indicates a positive shift in coverage, potentially aligned with the plan's equity goals.

Similarly, the average waiting time for DRT passengers is a valuable metric. If the target is to reduce it from 18 to 10 minutes, tracking this metric throughout the project helps define a KPI that measures the effectiveness of DRT system improvements in reducing user inconvenience.

KPIs serve a highly practical purpose, meaning that while some indicators might theoretically be the best for a specific LPTP, they may face real-world challenges in terms of calculation and data availability.

For this reason, selecting the most suitable KPIs for evaluating the performance of a LPTP should be based on the **SMART** criteria:

- **Specific** – Clearly defined and directly related to the plan's objectives.
- **Measurable** – Quantifiable through reliable data sources.
- **Achievable** – Realistically measurable given available resources and technology.
- **Relevant** – Aligned with the strategic goals of the plan.
- **Time-bound** – Evaluated over a defined period.

This strategy proposes a comprehensive list of metrics that can be used as KPIs to support cities in assessing the effectiveness of their LPTPs.

List of Metrics

The following list (Table 8) includes over one hundred potentially useful metrics categorized by thematic area (general, transport, economy, social, environment, communication/engagement) and by type of intervention (e.g., demand-responsive transport, network optimization, alternative fuel transition). These metrics are intended to support the development of tailored KPIs for each local public transport plan, based on local priorities and strategic goals.

Table 8 Metrics suggested to define KPIs [Source: OPTI-UP Project team]

GENERAL	
1	Share of population (estimated) covered with high frequency routes (e.g. 15 minutes headways - depending on the local conditions)
2	Share of population (estimated) in 350m proximity to stops and stations
3	Infrastructure for LPT: km of railroads, km of dedicated bus lanes, km of trolleybus network
4	Percentage of trips that run on schedule (on-time performance)

5	Integrated PT planning with spatial planning (scale 0-3)
6	Total annual revenue from tickets
7	Technologies used for ticketing
8	Passenger counting technologies
9	Availability and utilization of public transport information systems
10	Operational costs (drivers, energy, etc.)
11	Cost for administration
12	Number of drivers
13	Number of vehicles
14	Number of low floor vehicles
15	Number of adequately equipped stations/stops
16	Accessibility of stops/stations for vulnerable groups
17	Commercial speed of public transport vehicles
18	Implementation of a route planner (yes/no)
19	Web page visitors' counter
TRANSPORT	
a) DRT (Demand Responsive Transport)	
20	Number of DRT vehicles in service
21	Average number of DRT passengers per vehicle per working day
22	Average number of DRT requests per working day
23	Percentage of fulfilled DRT requests
24	Average waiting time for DRT passengers
25	Number of DRT departures per working day
26	Number of DRT passenger km per day
27	Average DRT kms per driver
28	Average DRT kms per vehicle
29	Average number of empty DRT kms per working day
30	Number of detected deviations (e.g. complaints)
31	Share of empty DRT runs / total DRT runs
32	Share of car + van rides over total DRT departures
33	Average travel time from origin to destination
34	Average total time to reach destination (weighted by passengers)

35	Potential DRT passengers: population within 300 m of DRT stops
36	Weekly average of daily DRT departures
37	Number of weekly DRT passengers
38	Number of refused DRT reservations
b) Network Optimization	
39	Number of active lines and sub-lines per mode
40	Average line length per mode
41	Average number of passengers per mode per working day
42	Average kms travelled per mode per day
43	Average number of empty kms per day
44	Average number of trips per day per mode
45	Average vehicle occupancy
46	Passenger/km ratio
47	Number of daily departures per line and mode
48	Number of passenger km per day
49	Average kms per driver
50	Average kms per vehicle
51	Change in service frequency
52	Number of settlements reachable
53	Number of new lines reaching outer areas
54	Number of citizens in newly reachable areas
55	Km of buses out of service
56	Ratio between passenger km and vehicle km
c) Alternative Fuel	
57	Percentage of vehicles by fuel type (electric, hybrid, etc.)
58	Number of zero emission vehicles
59	Average number of passengers per electric vehicle per day
60	Average number of passengers per vehicle (all types) per day
61	Average kms travelled per electric vehicle per day
62	Average kms per vehicle (all types) per day
63	Average range per electric vehicle per charge
64	Change in fleet age

65	Number of charging stations
66	Increase in number and efficiency of vehicles
ECONOMY	
a) DRT	
67	Cost per DRT line per month
68	Cost per DRT line per passenger
69	Average revenue per passenger
70	Share of driver and energy costs over total operational costs
71	Share of monthly/yearly tickets in total ticket revenue
72	Total yearly cost per DRT km
73	Total yearly cost per DRT travel
b) Network Optimization	
74	Revenue per km travelled
75	Average cost per km travelled
76	Average revenue per passenger
77	Share of driver and energy costs over total operational costs
78	Share of monthly/yearly tickets in total ticket revenue
79	Change in cost per km for buses
c) Alternative Fuel	
81	Cost of fleet transition (investment per vehicle)
82	Operational cost savings (fuel/maintenance) per vehicle/month
83	Revenue per km travelled
84	Average revenue per passenger
85	Share of driver and energy costs over total operational costs
86	Share of monthly/yearly tickets in total ticket revenue
SOCIAL	
a) DRT	
87	Cost per DRT line per month
88	Cost per DRT line per passenger
89	Share of population in 350m proximity to stops
90	Number of low floor vehicles
91	Number of equipped stations/stops

92	Difference in ticket cost between normal passengers and social groups
b) Network Optimization	
93	Customer satisfaction (comfort, waiting, punctuality)
94	Share of commuter's vs occasional users
95	Accessibility for vulnerable groups
96	Share of population in 350m proximity to stops
97	Number of low floor vehicles
98	Number of adequately equipped stops
99	Ticket price difference for social groups
100	Change in use of LPT by elderly
c) Alternative Fuel	
101	Public awareness and satisfaction (surveys)
102	Share of population in 350m proximity to stops
103	Number of low floor vehicles
104	Number of adequately equipped stations/stops
105	Ticket price difference for social groups
ENVIRONMENT	
106	CO_2 emissions per km per user
107	Total CO_2 emissions per year (absolute and per passenger)
108	Share of zero emission vehicles in fleet
109	Share of kms travelled by zero emission vehicles
110	Share of Euro 6 or equivalent vehicles in fleet
111	Share of kms by Euro 6 or equivalent vehicles
112	Energy consumption (fuel/electricity/gas) per km per user
113	Average fuel consumption per km (all vehicles)
114	Change in CO_2 emissions/year due to LPT
115	Change in noise due to buses (if measurable)
COMMUNICATION/ENGAGEMENT	
116	Number of digital communication channels (website, Facebook, etc.)
117	Number of posts per month
118	Number of followers
119	Number of feedback/suggestions received

120	Number of satisfaction surveys per year
121	Number of citizen proposals integrated into plans/projects
122	Number of tools used for planning
123	Number of trained personnel

KPI Template

This template (Table 9) is designed to help planners define SMART KPIs that can effectively support monitoring, evaluation, and comparison with model-based simulations (e.g., VISUM, MARS).

Table 9 Template to define and describe KPIs [Source: OPTI-UP Project team]

1 General Information
KPI Name:
Category: (e.g., Mobility, Environment, Social, Economic)
Associated Goal:
Description: Brief explanation of what the KPI measures and why it is relevant.
Responsible person/office
2 Technical Details
Metric: (What is being measured?)
Unit of Measure: (e.g., %, km, CO_2 tons, passengers/day)
Baseline Value: (If available)
Baseline Year:
Target Value:
Target Year:
Source of Data: (e.g., local database, surveys, national statistics)
3 SMART Criteria Check
Specific: Is the KPI clearly defined and focused?
Measurable: Can it be quantified and tracked over time?
Achievable: Is the target realistic given local capacities and context?
Relevant: Is the KPI aligned with the strategic goals of the plan?
Time-bound: Is there a clear timeframe for reaching the target?
4 Simulation Relevance
Can the KPI be estimated using transport models?
Yes / No

If yes, specify models applicable:
Four step Transport Model
Activity Based Model
MARS
Other: ____________
5 Notes and Considerations
Critical Assumptions: (e.g., stable demand patterns, policy implementation)
Potential Limitations: (e.g., data gaps, modelling constraints)
Suggested Frequency of Monitoring: (e.g., annually, biennially)

Targets

When selecting KPIs to monitor the implementation of a local public transport plan, it is highly recommended to associate each indicator with a target value. Targets provide a benchmark for success and help measure the actual effectiveness of actions over time. However, defining such targets requires careful consideration of the local context and therefore may not be appropriate in this strategic document.

In this document, specific targets are not proposed, as they must be defined at the operational level, in close connection with the city's characteristics, priorities, and constraints. Nonetheless, it is important to outline the main elements that should guide target setting in the subsequent phases:

- Political priorities and vision, as defined by local decision-makers,
- Higher-level policy goals, such as those set by the EU, national strategies, or regional frameworks,
- Expectations and needs of citizens, collected through surveys, consultations, or participatory processes,
- Results of transport models and simulations, which can provide realistic estimates of potential impacts and system capacity.

By grounding targets in this multi-dimensional framework, cities can ensure they are both ambitious and achievable, reinforcing the alignment between planning, implementation, and monitoring.

Conclusion and Next Steps

The OPTI-UP strategy presents a pragmatic and adaptable planning methodology, tailored to the specific needs of small and medium-sized cities in Central Europe. Developed through a collaborative process with stakeholder support and feedback, the methodology addresses the **key challenges** these cities often face, such **as limited financial and technical resources, fragmented data and lack of structured planning experience**, offering a comprehensive yet flexible framework for local public transport development.

By building on detailed contextual analysis and aligning local strategies with broader European and national policy objectives, the methodology ensures that proposed interventions are evidence-based and strategically coherent. The inclusion of practical tools such as SWOT analysis, scenario modelling and monitoring further supports cities in making decisions.

The methodology not only contributes to improving public transport systems in the short term but also strengthens local planning capacity and promotes long-term institutional development.

Integrating transportation and land use models into the planning process provides small and medium-sized cities with a different, evidence-based approach to support robust and adaptable decision-making. Using models such as the Four-Step Transportation Model and LUTI models enables a better understanding of future opportunities, aligning proposed actions with broader goals of sustainability, equity and efficiency. These tools not only support the technical assessment of transportation interventions and spatial planning but also promote more transparent and participatory planning processes and provide visual and quantitative representations of potential future scenarios. Models facilitate stakeholder dialogue, improve public communication and build trust in the decision-making process.

However, the effectiveness of modelling depends on its integration into a broader strategic planning framework. **Models should not be used in isolation, but in combination with stakeholder engagement, policy coherence analysis and flexible planning mechanisms.** This integrated approach ensures that models inform the implementation of local public transport plans, supporting cities in creating transport systems that are resilient, responsive and aligned with long-term urban development goals. Ultimately, by combining scenario-based modelling with local knowledge and participatory governance, cities can move from reactive planning to proactive strategy-making, creating public transport systems that are not only technically sound, but also socially and environmentally sound.

The Monitoring section completes this framework by offering tools for continuous evaluation. KPIs, derived from well-defined metrics and aligned with SMART criteria, will allow cities to measure progress, evaluate effectiveness and improve accountability over time. By integrating systematic data collection and stakeholder engagement, the Monitoring system ensures that implementation remains transparent, evidence-based and responsive to evolving needs.

However, the ultimate success of any LPTP depends not only on its technical soundness, but also on the commitment of all the actors involved. This includes political leadership, administrative coordination, collaboration between operators and active citizen participation. Strategic decisions must be strengthened by long-term investments, regulatory clarity, institutional support and continuous communication with the public. In an increasingly complex mobility landscape, characterised by demographic changes, technological innovation and climate imperatives, public transport remains a key pillar for inclusive, efficient and sustainable urban development. This document serves as a guide and reference for cities wishing to improve their local public transport systems, while contributing to the achievement of wider regional, national and European objectives.

By adopting this framework and adapting it to their specific contexts, cities can create resilient transport systems that improve quality of life, reduce environmental impact, and foster economic vitality. The challenge now is to move from planning to action, turning ideas into outcomes and ambitions into accessible, reliable, and equitable mobility for all.