

EIB Jaspers

CAPACITY BUILDING FOR SUSTAINABLE URBAN MOBILITY PLANS



Multi-Modal Plan Scenario Building in SUMPs

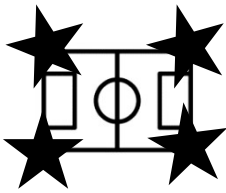
Stockholm, 5-6 May 2026

What is (is not) a Scenario in a SUMP? (according to JASPERS)

- It's not a description / photo of today's situation
- It's not a forecast (future as an extrapolation of today's trends)
- It's not a package of projects or measures for the future
- **It's an internally consistent view of how the future "transport system" might work**



And what is its purpose?



Can we SUMP objectives be met? based on selection of measures, and analysis. Insight into bandwidth of realistic future possibilities.



Understanding the impact of certain choices within the mobility system



Appraisal and comparison of different options to choose the best performing one

Understanding What a Scenario Is:

A scenario is not an assessment of the current situation, nor is it simply a prediction of the future based on current trends. It goes beyond a collection of projects or isolated measures. Scenarios represent internally consistent visions of how the future 'transport system' might function. Here, 'transport system' refers to the structure, overarching framework, overall scheme and operations, rather than focusing on highly specific projects or measures. For example, a scenario at the 'system level' might illustrate a hierarchical network of public transport systems with different levels of service, without necessarily specifying the type of rolling stock that will be used." Importantly, scenarios should have significant potential to address issues identified by the SUMP and meet related objectives.

Benefits of Scenario formulation and appraisal:

- 1.Avoiding Tunnel Vision:** Scenarios prevent premature commitment to a single solution.
- 2.Insight into Future Possibilities:** They provide an understanding of the range of realistic future outcomes, helping to identify what is feasible.
- 3.Testing Measures:** Scenarios may help to evaluate which measures most effectively contribute to the SUMP's goals and how these measures interact with each other.
- 4.Challenging Ineffective Measures:** They may enable the identification of measures that do not work, highlighting the need for alternative solutions.

5. Managing Uncertainty: Scenarios allow for 'what if' analyses, making it easier to navigate uncertainties.

6. Stimulating Creativity: They encourage imaginative thinking and openness to different ideas.

7. Appraising and Selecting Options: Scenarios help in evaluating different options and selecting the most suitable one.

Using Scenarios:

Scenarios can be used in various ways. Their main role is to compare alternatives at the system level, assessing them through methods like multi-criteria analysis, and then choose the best performing option (in meeting SUMP objectives). Additionally, scenarios can help test the impact of specific measures, identify resulting mechanisms, and uncover potential side effects (e.g., what happens when a road is closed and how traffic patterns shift). These insights can then inform the development of a preferred scenario. Additionally, scenario level analysis can help define the range of possible changes in the mobility system, such as exploring the effects of implementing aggressive pricing or parking policies. These results can later contribute to the creation of a preferred scenario.

System-Level Scenario Development:

When developing scenarios, we focus on proposing a way forward for the development and operation of the city's transport system. This is then expanded into a set of organizational, operational, and infrastructure measures. At the system level, scenarios explore different configurations of the overall transport system, including relating to under-used parts of the system. For example, scenarios might consider high-speed or high-capacity corridors served by trains, trams, metros, or even buses, as well as alternative land-use options designed around these transport modes. Additionally, these scenarios would consider how the 'feeder' public transport system integrates with the core network. These different configurations are what we refer to as scenarios in this context.

Based on: <https://civitas.eu/resources/city-specific-urban-mobility-scenarios-d31>

How to build a Multi-Modal Scenario in SUMP?

- Plan the multimodal transport system at the right scale: the **Greater Urban Area**
- Plan at **system-level**, with a **multimodal hierarchy** of the network
- **Focus on operations**
 1. High-capacity (**core**) and feeder transport **networks**, consistent with transport demand
 2. **Integration**: multimodal, PT timetables, fares, B&R, P&R, etc
 3. **O&M aspects** (PT frequency and capacity, rolling stock and propulsion technologies, depots, parking, demand management, etc.)
 4. **Consistent with and supporting** current and future **land use plans**
- Scenarios must be based on early public and stakeholder engagement and help meet SUMP objectives (both high-level and specific)
- Use the **right approach and tools to evaluate** scenarios and select best performing one.

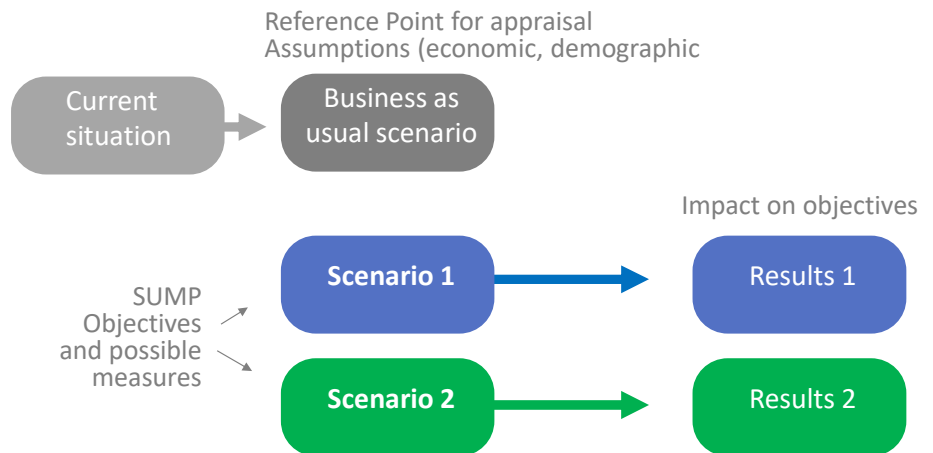
Concerning operational aspects in Scenario Building : When constructing scenarios within the SUMP, it is essential to emphasize the importance of operational aspects. This includes considering elements such as the hierarchical structure of the transport network, the complementarity and integration of various transport modes, capacity, service frequency, maintenance and depot facilities. In some cases, the differences between competing scenarios may not lie on the physical layout or extent of the public transport network, but rather on the operational concepts that underline them. Therefore, careful attention must be given to these operational dimensions when evaluating and comparing scenarios.

Concerning Public transport network: In the development of Sustainable Urban Mobility Plans (SUMP), planned extensions to the public transport network may initially lack specific details regarding the mode of transport—whether rail, tram, bus, etc. These details can be determined during later stages of the planning process, such as through options appraisal within the SUMP framework or during project-level feasibility studies.

Concerning Integration of transport and Land use planning : A key component of the SUMP is to assess and highlight areas where there is insufficient integration between transport and land use planning. While the SUMP can identify these issues, it is generally within the scope of other planning instruments to make modifications to land use policies. However, the SUMP may propose specific developments in the transport system based on consultations and collaborations with relevant land use departments, ensuring that any proposed solutions are aligned with broader urban planning objectives.

Key Ingredients of Scenario Building in many SUMPs

- Current situation and business as usual situation (preferably with multiple economic and/or demographic assumptions to deal with uncertain future) as baseline
- Multiple scenarios with different approaches to tackle problems and challenges from BAU-scenario(s), clear link to SUMP objectives and problems identified by analysis
- Take advantage of early public and stakeholder engagement
- Analysis to evaluate scenarios and select best ingredients



Examples of scenarios for a large city:

- * Create high-capacity railway backbone from existing lines and provide multimodal integration with it
- New (or extended) metro backbone, reconfiguration of the current network and creation of new integrated feeder network
- Lower capacity but wider coverage system mostly based on extending BRT network and services.

The diagram starts with the **Current Situation**, which represents the present state or baseline of the system being analyzed. From this point, an extrapolation is made to predict the future of the current system (1) with consideration of committed / planned changes to strategic (eg national, TEN T) networks but without significant changes or interventions at the urban / local level (the current system remains, with the necessary adaptation). This predicted future state is termed the **Business As Usual (BAU) Scenario**.

The **Business As Usual** Scenario serves as a reference point, showing what the future would look like if current trends and behaviors continue unchanged. This scenario is crucial for understanding the baseline against which other potential futures can be compared. Importantly, the BAU scenario should not only be used as a comparison but should also provide important elements for further analysis, helping to identify

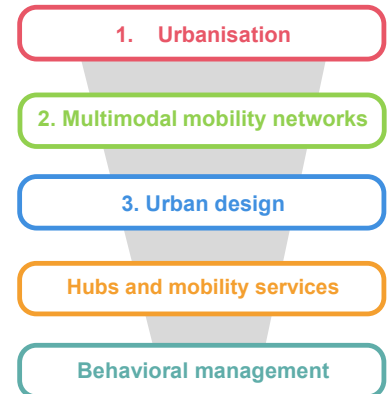
areas where intervention will be needed.

It's also important to note that when estimating greenhouse gas (GHG) emissions, the reference point is the current situation, not the BAU scenario. This approach aligns with the EU SUMP Topic Guide on Decarbonisation (also covered in Module 10), ensuring that GHG estimates are based on the present situation rather than projected trends.

A number of **Scenarios** may be produced, on the basis of there being different alternatives able to meet the SUMP objectives (based both on strategic policies and analysis). Each scenario represents a different possible future way to meet the SUMP objectives that results from making specific adjustments or interventions on the urban transport system. Adjustments could involve changes in policies, strategies, technologies, or other influential factors, but it should be ensured that the options are comparable. In some cases it may be justified to have a single option (with possibly, some sub-options to be considered under it).

Key Ingredients of Scenario Building in many SUMPs

- Plan at system-level of the Greater Urban Area, including integration with strategic network (e.g. TEN-T nodes, national infrastructure)
- Relation with land use plans (supporting and co-directing future development)
- Defining multimodal and hierarchical mobility networks (walk, bicycle, public transport, private car, logistics, hierarchical e.g. for public transport high-capacity (core) and feeder transport networks, consistent with transport demand)
- Physical and non physical ingredients: also PT services and fares, P&R, parking policies, behavioral management, etc
- Consider organisational aspects and potential implications of each scenario



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There *are* other types of scenario....

- Explorative – what might happen given various uncertainties in "external" world
- Normative – what should happen
- Backcasting – how to get from a situation we're in now to one we want to be in the future – what can policies achieve – but working back from the point in the future
- Policy packages – groups of different types of measures and their predicted impacts

- Tendency in SUMPs to use policy packages
- They are not the only type!
- But now we return to the JASPERS and policy packages

There are various ways to define and understand scenarios. Each has their advantages and disadvantages. The key thing is to ensure that when using scenarios, they are properly defined in any document and everyone involved in the planning process has a common understanding of what is meant by “scenario” in this context. As noted in the slide, many SUMPs, and the EU SUMP Guidelines, tend to conflate policy packages with scenarios. Policy packages have their place but they do not for example take into account possible future uncertainties in population, fuel prices and so on that explorative scenarios can do. They also do not show what combination of measures is required to achieve a desired outcome (this would be backcasting).

Optimizing PT and Land Use Integration and Demand Management

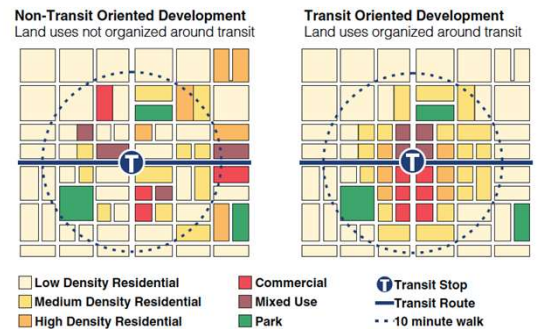
Land Use Planning; impact on transport:

- Reduces need and distance to travel.
- Increases the viability of public transport.
- Enhances walkability and cycling options.

Demand Management; impact on transport

With strategies on congestion Pricing, Parking Management, Incentives for Sustainable Transport

- Reduces congestion.
- Balances transport demand across modes.
- Supports environmental sustainability.
- Preventing heavy investments in infrastructure



Source : City of Seattle, Office of Planning and Community Development "Block44: Example of Transit Oriented Development"



Land Use Planning:

- **Definition:** Strategic development of urban spaces. These may (or may not) help increase transport efficiency and accessibility.
- **Objective:** Encourage land use and urban development policies and measures (e.g. high-density, mixed-use developments, urban design, others) that reduce the need for travelling or long commutes and promote sustainable mobility (e.g. joint active mode and public transport use).

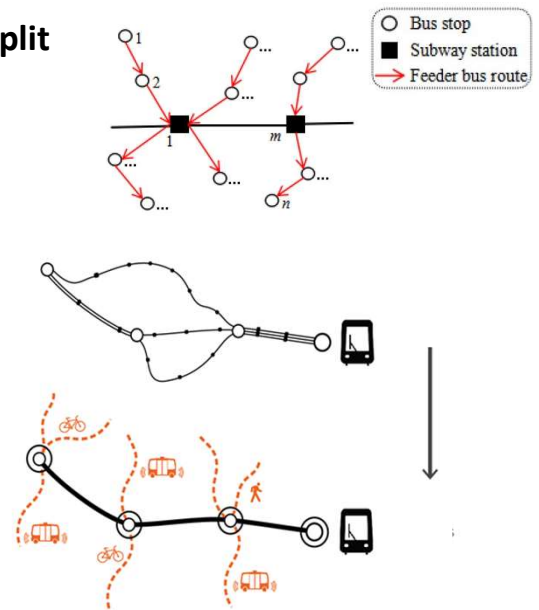
Demand Management:

- **Definition:** Policies and measures designed to influence travel behavior and manage transport demand.
- **Some examples:**
 - **Low emission zones:** limiting access to certain areas by certain types of vehicles.
 - **Congestion Pricing:** Charges for driving in congested areas to reduce traffic and encourage alternative transport modes.
 - **Parking Management:** Limited and priced parking to discourage car use and promote public transport.
 - **Incentives for Sustainable Transport:** Benefits for using public transport, cycling or walking.

Optimizing PT and Land Use Integration and Demand Management

Planning Sustainable Public Transport: impact of modal split

- Developing the core network:
 - Align with long term vision on urban development
 - Improve existing and new cores (operational, network extension).
- Planning Effective Feeder Systems:
 - Feeder system and routes: Link local areas to core PT network.
 - Supporting mobility: Comprehensive coverage and accessibility.
 - Offer: Supply-based and demand-based, inclusive for all users.



8

Funded by the European Union

- **Integrated Planning:** SUMP focuses on creating a balanced transport network where local network and services effectively link to the core network.
- **Long-Term Vision:** Aligns feeder services with broader urban development and sustainability goals.
- **Feeder Systems:** Lower capacity transport network and services that link local areas to the core public transport network.
- **Supporting Mobility:** Ensures comprehensive coverage and accessibility, making it easier for residents to reach major transit lines.

Planning Effective Feeder Systems:

- **Tailored offer:** Develop routes that meet the specific needs of different neighborhoods, connecting them to the core network.
- **Frequency and Reliability:** Ensure integrated, frequent and reliable feeder services to minimize overall journey time and enhance convenience.
- **Accessibility:** Make feeder services accessible to all users, including those with disabilities and those in less densely populated areas.
- **Active modes:** Ensure seamless integration with PT. Combine cycling infrastructure, pedestrian pathways, urban design and shared mobility measures to support feeder routes.
- **Consider likely O&M and OPEX** impacts when planning network and operations.
- Transition to low / zero emission fleets: potential technology options, their

features and constraints, operational implications and other impacts, charging / fuelling infrastructure, grid and logistics).

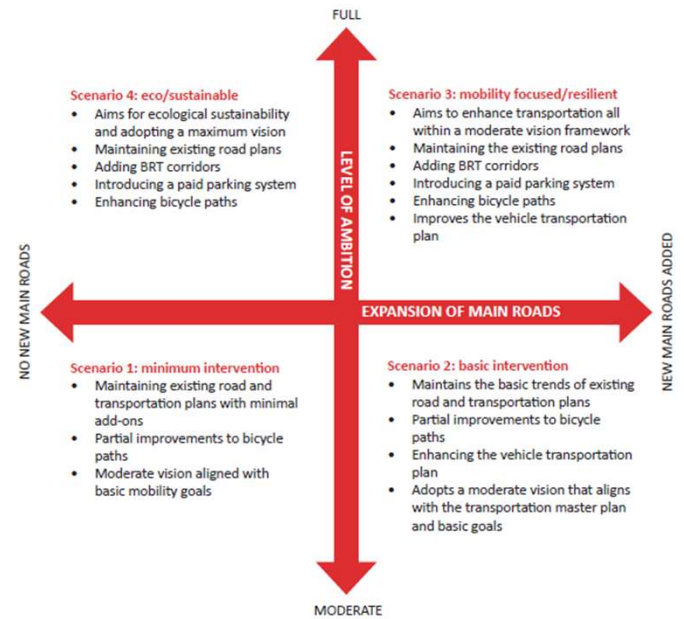
- Importance of cycle network planning maximising synergies with the remainder of the system, helping meet the overall objectives, without undermining overall performance)

Scale: while a small city SUMP may entail almost full definition of feeder networks, this may be done at a higher level in a large metropolitan SUMP, with more local level plans dealing with it.

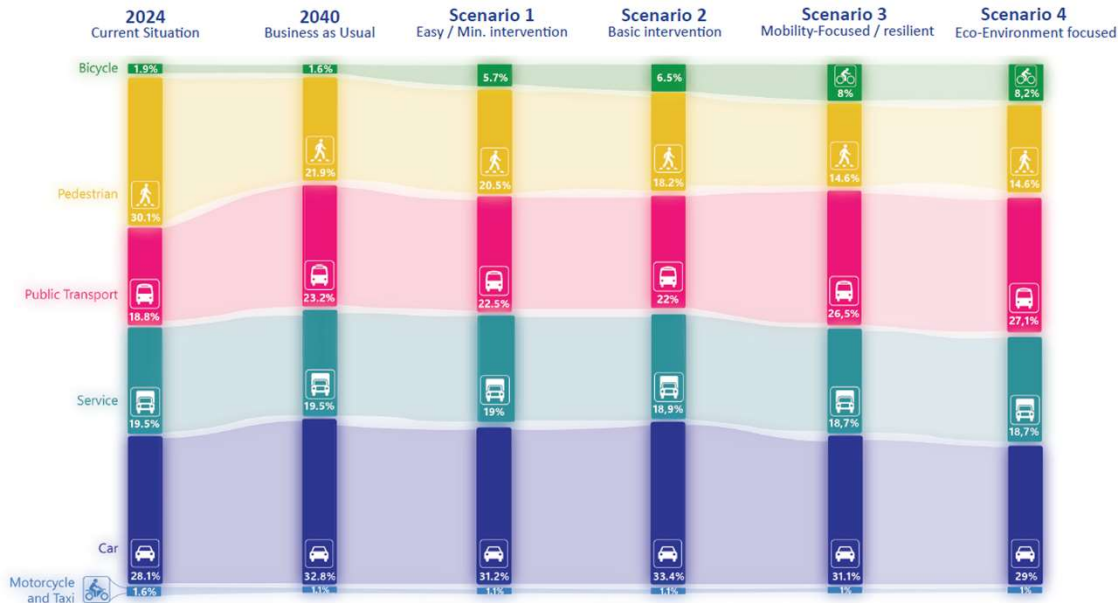
Example: SUMP Düzce (Türkiye)

Four scenario's based on stakeholder sessions

- Main variable 1: focus on new infrastructure
- Main variable 2: level of ambitions
- Analysis with traffic model, comparisons with business as usual scenario
- Conclusions: focusing on combination of Scenario 3 and 4 in the SUMP



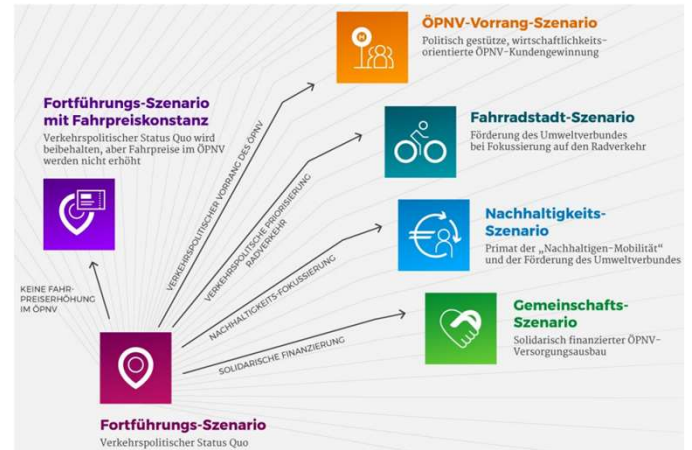
Example: SUMP Düzce (Türkiye)



Example: SUMP Leipzig (Germany)

Six scenarios leading to one preferred scenario

1. Continuation of current mobility strategy
2. Continuation of current mobility strategy with constant fares;
3. Sustainability scenario;
4. Bicycle City scenario;
5. Public transport priority scenario;
6. Community scenario.



The city of Leipzig developed six scenarios for different future options in a scientific and open process.

The six scenarios were:

1. Continuation of the current mobility strategy;
2. Continuation of the current mobility strategy with constant fares;
3. Sustainability scenario;
4. Bicycle City scenario;
5. Public transport priority scenario; and
6. Community scenario.

The scenarios were evaluated using various criteria (attractiveness for users, ecological attractiveness, economic attractiveness, systemic attractiveness) and a qualitative assessment.

On the basis of defined objective evaluation criteria (with regard to user attractiveness, ecological, economic and systemic attractiveness), the six scenarios were evaluated qualitatively and quantitatively with a time horizon of 2030, and the corresponding effects on local public transport were mapped to the time horizon of the upcoming local transport plan (2024).

At the end of September 2018, the council unanimously decided in favour of the sustainability scenario as Leipzig's mobility strategy for 2030, thus setting the course for the city's transport policy in the coming years. The sustainability scenario aims to create a city worth living in that takes into account all stakeholder groups (e.g. citizens, tourists, business people, but also clubs and associations) and excludes no one. The focus is on promoting sustainable mobility using environmentally friendly modes of transport, i.e. walking, cycling, buses and trains, as well as supporting mobility services that offer alternatives to using your own car.

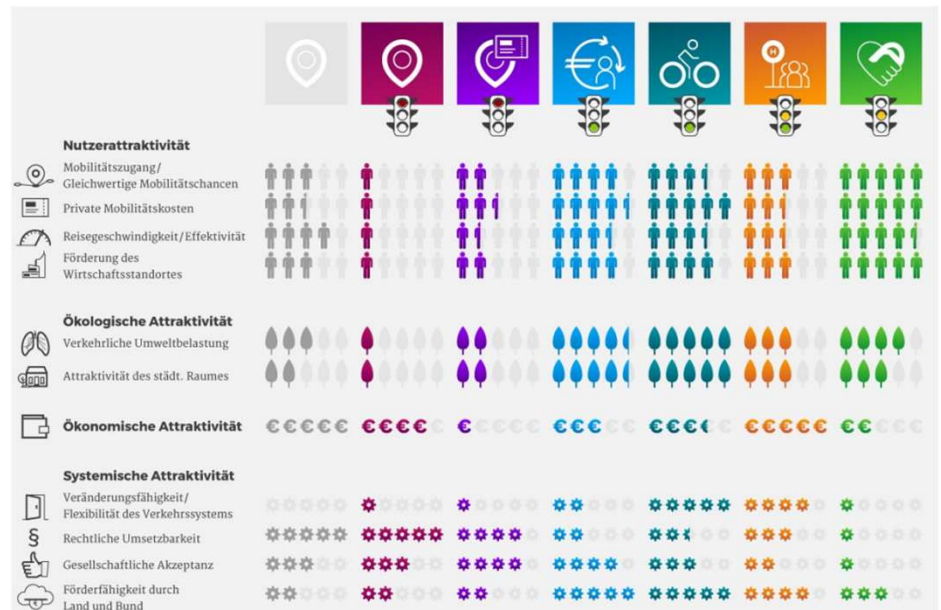
<https://www.leipzig.de/umwelt-und-verkehr/verkehrsplanung/mobilitaetsstrategie-2030/nachhaltigkeits-szenario>

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Example: SUMP Leipzig (Germany)

Appraisal of scenarios

- User comfort (people)
- Environmental qualities (planet)
- Economical performance (prosperity)
- Flexibility of mobility system, legal feasibility, stakeholder support



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Example: SUMP Prague (Czech Republic)

Use of scenarios (fitting within a common vision) to launch debate on suitable direction for future Prague:

- Effective Prague (focus on walk, cycle, PT, regulate car use)
- Rational Prague (range of small improvements instead of major one-off investments)
- Liberal Prague (continue current trends, high capacity road system to free crowded streets, toll system in congested areas)
- In the end: Effective Prague with elements of other scenarios

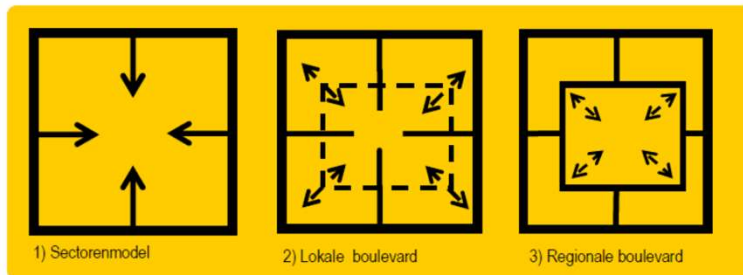


More information on

https://poladprahu.cz/wp-content/uploads/2019/11/Mobility_Plan-Brochure_EN.pdf

Example: Utrecht attractive and accessible

- Three scenarios to accommodate the debate on the future of the city ring road
- Analysis with traffic modeling (vehicle km, emissions, CO2, car traffic amounts))

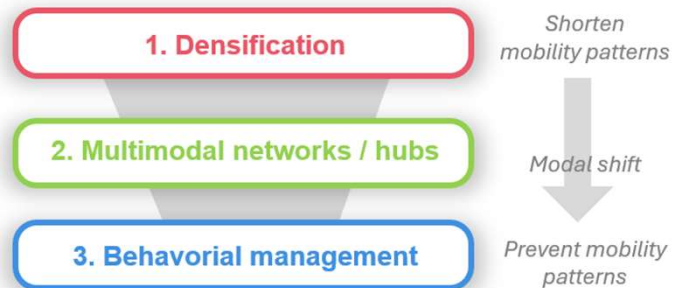


Here the debate was about the role of the inner ring road in Utrecht, which at the time of the inception of the report was still a high capacity main road, but there were aspirations to reduce its capacity and devote the space to other modes and greenspace. This was ultimately done so a mixture of two scenarios (options, policy packages) was chosen – 1 and 2.

Example: Mobility strategy Utrecht metropolitan region (U Ned)

Three scenarios leading to insight: 'we need all different types of measures to reach the formulated goals':

1. Scenario 'urban densification within existing city borders'
2. Scenario 'optimizing networks for PT, car, bicycle'
3. Scenario 'behavioral management, car parking policy'

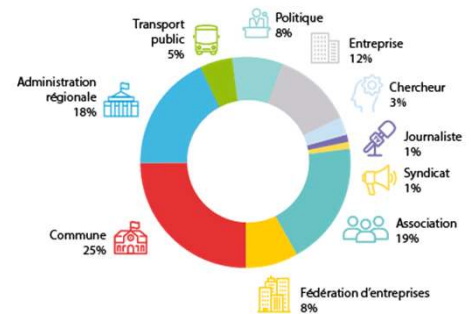


This is an example of policy packages and comparing them, but it is also a form of backcasting since it assesses what level of implementation of measures is required to achieve a certain goal, in this case CO2 emissions reduction.

Engaging Stakeholders in Developing Transport Scenarios

- Importance of early Stakeholder Engagement in the SUMP, in order to inform analysis, objectives and **scenario definition**
- Key Stakeholders:
 - Local governments and authorities
 - Transport operators (e.g., national rail infrastructure companies), surrounding governments
 - Businesses and commercial organizations, community groups and residents
- Benefits of Stakeholder Engagement: Inclusivity, better planning, enhanced acceptance

Diversity of stakeholders who contributed to the participatory process



Source: Bruxelles Mobilité

Importance of Stakeholder Engagement:

- **Definition:** Involving various stakeholders (public, private sectors, and community groups) in the planning process.
- **Objective:** Ensure stakeholder perceived issues are properly considered.
- **Key Stakeholders:**
 - Local governments and authorities.
 - Transport operators (e.g., national rail infrastructure companies).
 - Businesses and commercial organizations.
 - Community groups and residents.
- **Benefits of Stakeholder Engagement:**
- **Inclusivity:** Ensures that the interests of all user groups are represented.
- **Better Planning:** Leads to more informed and realistic planning.
- **Enhanced Acceptance:** Increases public and organizational buy-in for proposed changes and developments.

"Good Move" participatory process :

Mobility is a critical issue for the Brussels-Capital Region. With the Good Move initiative, the Government launched a participatory process in October 2016 to develop its new regional mobility plan. This dynamic approach involved a wide range of Brussels and Belgian stakeholders—public, private, and non-profit sectors, as well as citizens—in a collective effort to find innovative solutions to mobility challenges.

The chart illustrates the diversity of participants who contributed to shaping the vision during the forum in April 2017. Notably, this stakeholder gathering played a key role in defining several scenarios that were instrumental in the development of the Good Move plan.

Scenarios – Key Principles summarized

- Development of scenario options aligned with analysis outcomes, strategic framework, objectives
- Long term focus, assess scenarios against the reference case (BAU) and compared to each other
- Combine infrastructure, operations, land use planning, demand management
- Evaluation of scenarios to compare performance (environment, economic, social)
- Possible to combine ingredients from different scenarios into a preferred set of Plan measures
- Different scenario types for different urban context



Smaller Dispersed settlements

Mid-Sized Cities

Conurbations

TYPICAL CASE STUDY EXAMPLES

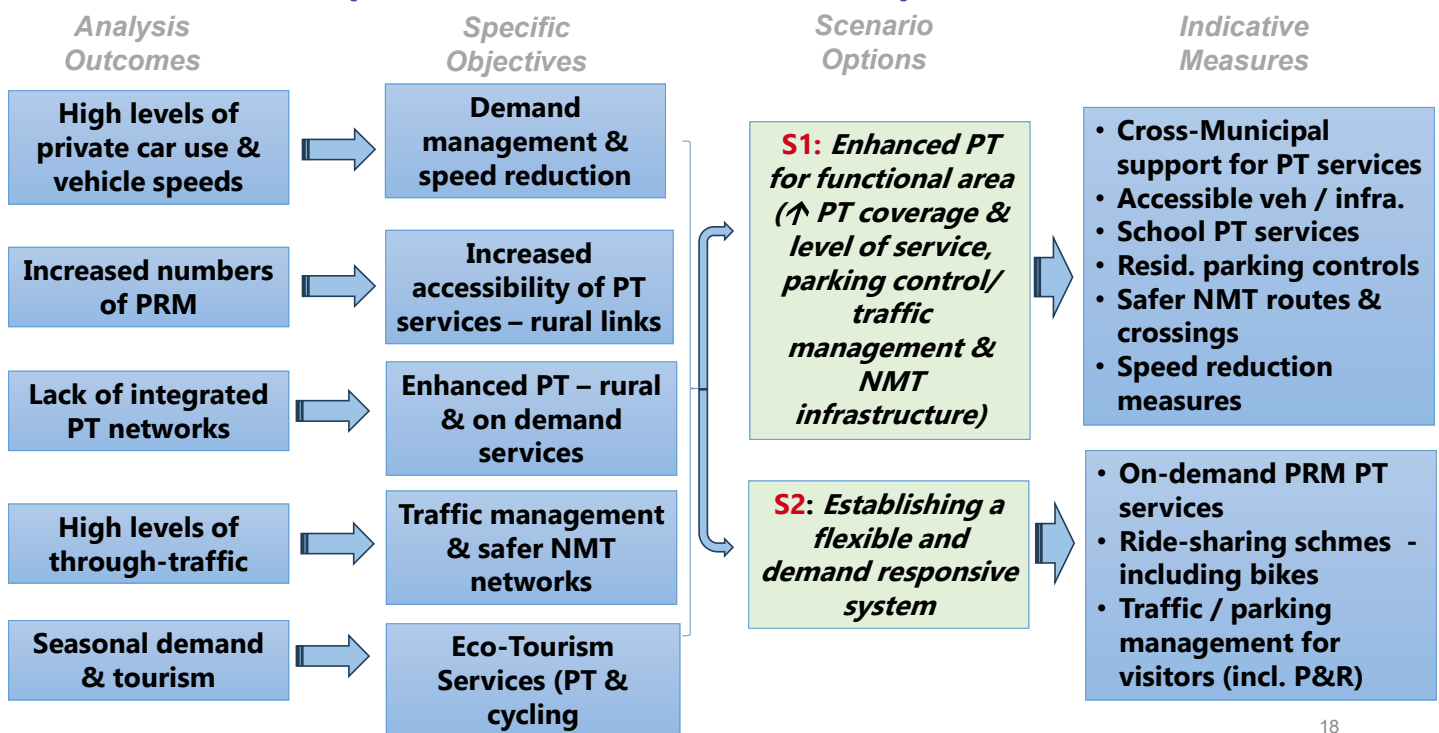
17

- The work on the SUMP analysis & development of objectives highlights where you are and where you want to go....the development of scenarios tell you how to get there.
- Scenarios must be aligned and reflect the outcome of the analysis work & the selection of SUMP objectives
- Scenarios are assessed against the reference case (Business-As-Usual) and compared to each other
- Scenarios will be evaluated based on a range of criteria: environment, economic, institutional, technical aspects
- Scenarios contain measures: SUMP action plan, different measures from different scenarios are combined together.
- Scenarios help refine the SUMP measures and inform a roadmap of sustainable mobility measures for the Plan

The following slides showcase the typical process for establishing scenarios for different types of urban areas covering:

- smaller, dispersed settlements
- Mid-sized cities
- Large conurbations

Scenario Development Process: Small / Dispersed Settlements



18

The context for this type of smaller urban area is quite different from mid-sized and larger conurbations in that trip levels and patterns are very different – low levels of commuting with dispersed trips, high levels of car ownership/use and low levels of public transport service provision.

Analysis Findings

For this type of smaller urban area the analysis outcomes are typically as follows:

- Predominance of the private car, due to settlement pattern, school trips and lack of reliable alternatives
- Large amount of PRM. Safety issues involving cyclists and pedestrians
- Lack of coordinated PT solution across municipalities, financial issues
- Large seasonal leisure and tourism visitors and traffic

Development of Specific Objectives

The analysis findings support the following specific objectives:

- Provide better access to key services
- Decrease use of the private car
- Increase accessibility (incl. for PRM) to the transport and public transport system

- Increase public transport and cycling use
- Increased pedestrian and cyclist safety
- Cater for seasonal demand and minimize impacts
- Improve financial sustainability of the transport sector

Scenario Options

Example scenarios (some options) that can be developed in response to the analysis outcomes and set of specific objectives include the following:

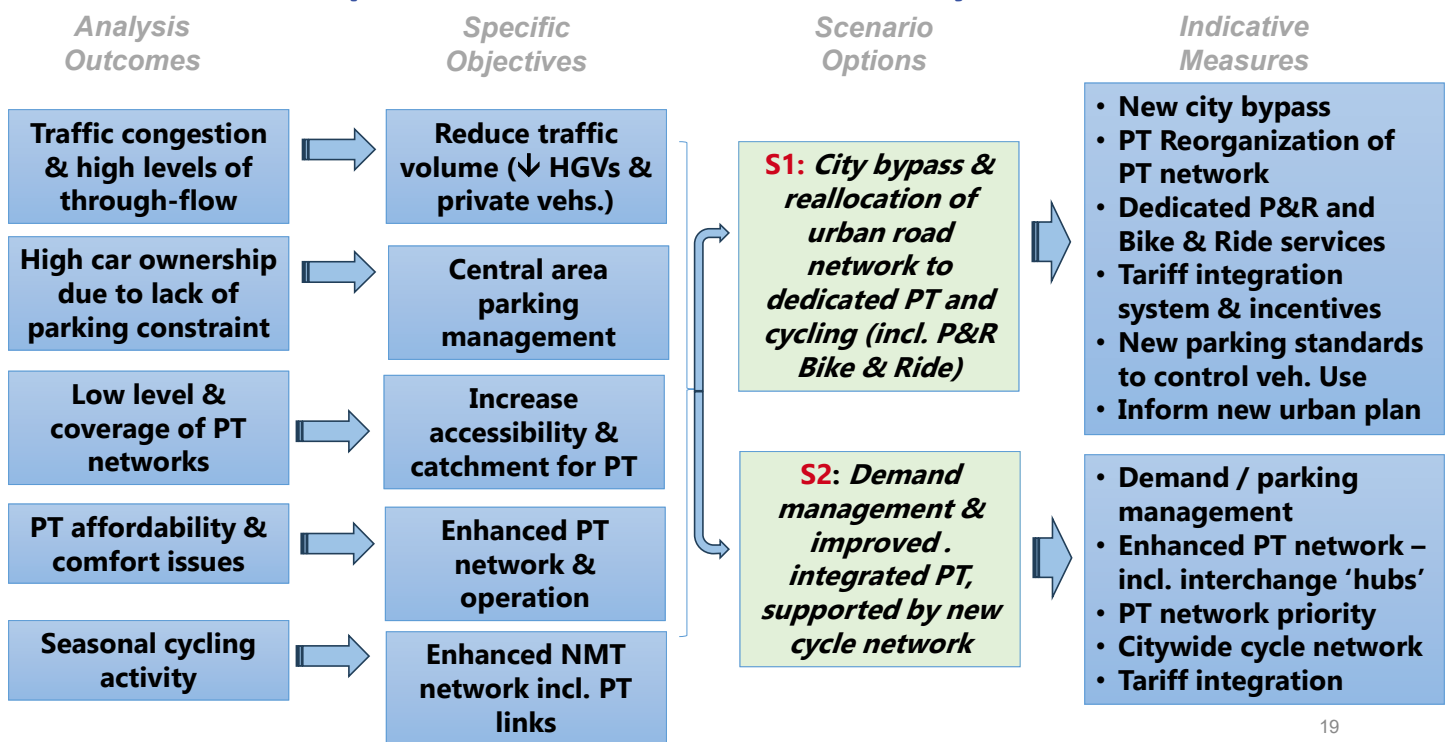
- **Scenario 1:** enhanced public transport system for the functional area (PT, parking, street / road and cycling infrastructure)
- **Scenario 2:** flexible and demand responsive system

Selection of Measures

Based on the scenarios developed for this type of smaller urban area, the types of measures available include the following:

- **Scenario 1:** launch joint management and financing of cross-municipal PT services, improve PT services to schools, accessible rolling stock & bus shelters, improve pedestrian and PRM accessibility including to / from PT stops, provision of traffic calming and safe pedestrian crossing at problem spots, develop a safe cycle network, improve street lighting , traffic management within villages and creation of paid visitor parking areas.
- **Scenario 2:** expand current PT offer with on-demand, PRM-friendly services, improve / launch dedicated school bus service, create network and bike rental scheme for tourists / visitors, improve street lighting, traffic calming, traffic and parking management for visitors.

Scenario Development Process: Mid-Sized City



The context for this type of mid-sized urban area is different from smaller dispersed settlements and larger conurbations in that traffic congestion is evident but this results from high levels of through-flow traffic and a lack of application of widespread parking controls. Public transport coverage and usage is relatively low compared to larger conurbations and the quality of vehicles is low, impacting on demand. Cycling activity is relatively low, typically only occurring during spring/summer seasons when there is favourable weather.

Analysis findings

For this type of urban area the analysis outcomes are typically as follows:

- Traffic congestion, due mostly to through traffic, urban spread and ease of parking
- Low use of public transport, due to inadequate network, low comfort, traffic congestion. Very seasonal due to cycling uptake
- Lack of integration and coordination between different PT modes
- PT comfort and affordability issues

Related Specific Objectives

The analysis findings support the following specific objectives:

- Decrease highway traffic (HGVs, private cars) through the city
- Increase public transport walking catchment and PT use overall
- Decrease seasonality of PT demand
- Manage / limit car parking in central areas

Scenario Definition

Example scenarios (some options) that can be developed in response to the analysis outcomes and set of specific objectives include the following:

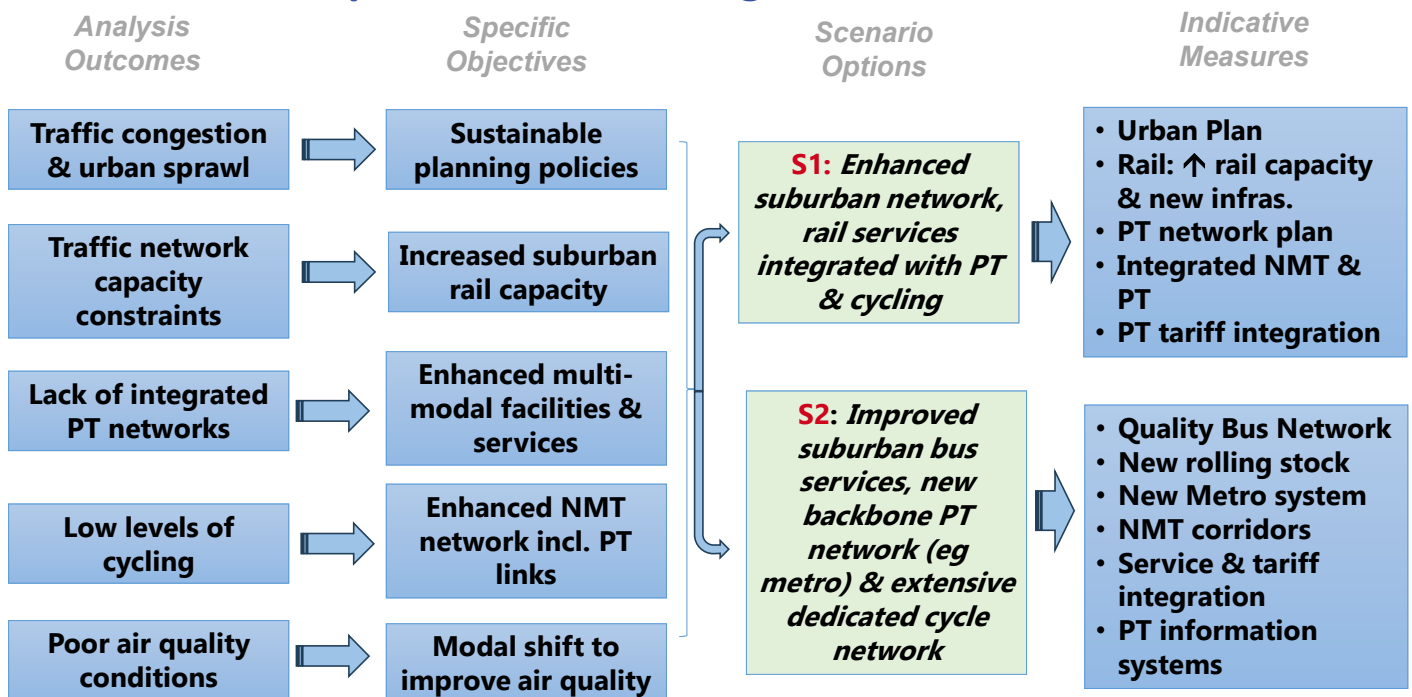
- **Scenario 1:** city bypass + partial reallocation of urban road network to dedicated PT and cycling (incl P&R and C&R)
- **Scenario 2:** demand management + improved and integrated PT and cycling system

Typical Examples of Measures

Based on the scenarios developed for this type of city, the types of measures available include the following:

- **Scenario 1:** new city bypass, reorganization of PT network with dedicated links, P&R and C&R system, new PT rolling stock, tariff integration including incentives for cycle – PT travel, new parking standards, inform next urban plan
- **Scenario 2:** demand management and parking management system, new long-distance passenger interchange, new PT lines and increased frequencies, PT priority at junctions, timetable integration, tariff integration incl cycle use

Scenario Development Process: Large Conurbation



20

The context for this type of larger urban area is quite different from mid-sized and smaller dispersed settlements in that trip levels and patterns are very different – high levels of commuting with dispersed trips across the city with high levels of car ownership and use in the suburban areas, there is a heavily congested road and public transport network, especially during period periods and lower levels of air quality resulting from high congestion levels. Whilst there is comprehensive urban public transport coverage, there is limited integration between rail and bus services, impacting on connectivity across the city and with adjacent urban areas.

Analysis Findings

For this type of larger urban area, the analysis outcomes are typically as follows:

- Traffic congestion due to urban spread and high car use outside core urban areas
- Capacity constraints for suburban travel due to road / rail freight demand
- Lack of integration between suburban railway and other public transport systems
- Little share of cycling due to long distances and safety
- Poor air quality in inner city areas

Development of Specific Objectives

The analysis findings support the following specific objectives:

- Promote & support planning policies that limit spread and the need to travel
- Increase suburban railway capacity
- Increase multi-leg, multimodal public transport travel (incl. railway)
- Increase integration of cycling and PT modes
- Improve air quality

Scenario Options

Example scenarios (some options) that can be developed in response to the analysis outcomes and set of specific objectives include the following:

- **Scenario 1:** Enhanced suburban network and railway services integrated with PT and cycling
- **Scenario 2:** Improved suburban bus services and new backbone PT network (e.g. metro) + extensive dedicated cycle network

Selection of Measures

Based on the scenarios developed for this type of larger urban area, the types of measures available include the following:

- **Scenario 1:** inform next urban plan, increase railway capacity and / or additional rolling stock , new railway stops and stations, reorganization of urban PT, create railway-based cycle & ride and associated network, tariff integration
- **Scenario 2:** creation of quality bus network, additional rolling stock, new metro system, creation of dedicated cycle infrastructure on suburban corridors, tariff and timetable integration, bus passenger information system

Scenario definition – Beneficial tips

- Align development of scenario options with strategic vision & objectives & analysis outcomes
- Start with realistic future Business As Usual scenario as basis
- Not focusing on short-term funding availability & eligibility, but: on current and longer-term urban needs
- Not only focus on infrastructure or specific technological solutions, but holistic approach including operational aspects
- Assessment of strategic vs local needs (e.g. incl. development of urban nodes)



21

- Development of scenario options that are clearly aligned with analysis outcomes & objectives
- Ability to meet current and longer-term urban needs (e.g. evolving scenario)
- Consider operational aspects (not just infrastructure focus)
- Assessment of strategic vs local needs (e.g. development of urban nodes) - Integrate local & strategic networks and local modes between themselves
- Mobility service integration:
 - Improved rail-based system, with feeder urban PT lines & integrated cycling networks
 - New / expanded PT backbone & new feeder PT lines
 - Establishing road bypass and improved urban PT, plus enhanced NMT routes
 - PT-oriented development (aligned with spatial plan and committed / future land use demand / development sites)
 - Improved existing urban transport system & demand management measures

Appraisal of scenarios - Objectives and criteria

- **Objective:** To ensure that scenarios are evaluated for their ability to achieve specific SUMP objectives, including their ability to minimise environmental, social, and economic impacts.
- **Methods:** Utilize impact assessment to measure direct and indirect effects, and achievement assessment to ensure alignment with predefined goals and Key Performance Indicators (KPIs) on:

- Environmental Sustainability
- Social Inclusivity
- Economic Efficiency
- Other objectives-based criteria



Example of Objectives and KPI :

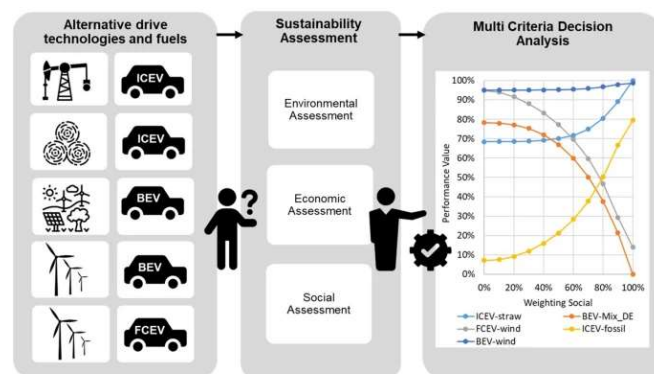
Objective	KPI
Reduce GHG's emissions	% reduction in CO2 emissions by year 20XX
Improve accessibility to Public Transportation	% of population within 500m of transit stop
Boost economic productivity	% reduction of average commute time

- Objective of Scenario Appraisal:
 - The primary objective is to evaluate scenarios to understand their performance and ensure they are able to deliver SUMP objectives. This involves, among others, looking at scenario impact regarding environmental, social, and economic aspects.
 - The ability to address local issues identified in the analysis and reflected in the detailed SUMP objectives should be a major consideration when appraising SUMP scenarios.
- Some methods:
 - Impact Assessment: This involves measuring the direct and indirect effects of each scenario. It helps to identify how each scenario affects various aspects of urban life and the environment.
 - Achievement Assessment: This method assesses how well each scenario meets the SUMP objectives and Key Performance Indicators (KPIs). It ensures that the proposed scenarios are not only impactful but also aligned with long-term urban mobility goals.
- Key criteria for assessing scenarios comprise environmental sustainability, social inclusivity (e.g. the scenario's impact on accessibility for all demographics, reduction in travel costs, enhancement of safety) and economic efficiency (likely cost performance and impact on the local economy). It ensures that the scenario supports economic goals by being cost-effective and promoting economic growth.

- Alignment with Long-term Urban Mobility Goals:
 - The scenarios must align with long-term goals, which include promoting sustainable growth by meeting environmental, social, and economic objectives. This alignment ensures that the urban mobility system is balanced, inclusive, and supports the overall development of the city.

Appraisal of scenarios: methods of scenario evaluation

- **Quantitative Methods** (numerical data)
Examples: traffic modelling, emission calculations, accidents, GIS-based analysis, cost estimation
- **Qualitative Methods** (perceptions and experiences), examples: Surveys, Focus Groups, Public Consultations.
- **Classification Methods: MCA**
Step 1: Criteria Selection (SUMP objectives)
Step 2: Weighting criteria
Step 3: Scoring & ranking of performances.



(Source: Haase, M., Wulf, C., Baumann, M. et al. Multi-criteria decision analysis for prospective sustainability assessment of alternative technologies and fuels for individual motorized transport. *Clean Techn Environ Policy* 24, 3171–3197 (2022).)

Benefits: Structured and Transparent Evaluation.

Quantitative Methods: Quantitative methods play a crucial role in scenario appraisal by utilizing numerical data and metrics to evaluate the impacts of different scenarios. These methods are focused on objective, data-driven analysis, which helps to quantify the potential effects of each scenario. For example, traffic modeling is used to predict changes in traffic flow and congestion across the urban area, providing insights into how scenarios might alleviate or exacerbate traffic and associated impacts. Emission calculations estimate the potential reductions in CO₂, noise and pollutants, helping to evaluate CC and environmental benefits of scenarios.

Qualitative Methods: While quantitative methods provide numerical insights, they involve non-numerical data that focuses on perceptions, experiences, and judgements. These methods are essential for capturing non quantifiable aspects of scenario appraisal, also in some cases reflecting the views and preferences of various stakeholders.

Classification Methods: Multi-Criteria Analysis (MCA) Multi-Criteria Analysis (MCA) is a systematic approach used to evaluate and prioritize scenarios based on multiple criteria. MCA works by first identifying the key factors that are important for assessing each scenario (e.g. cost, environmental, social related). These criteria are then assigned scores and weights according to their importance, reflecting the priorities and objectives of the SUMP (the criteria themselves must also reflect and cover properly the SUMP analysis findings and objectives). By aggregating these scores, MCA allows us to rank the scenarios and identify and improve the best performing options. The main benefit of MCA is that it provides a structured and

transparent decision-making framework, balancing diverse factors to support comprehensive evaluations. This approach, when properly carried out, ensures that all relevant aspects are considered, leading to well-informed and balanced decisions.

Appraisal of scenarios: zoom in on Multi-Criteria Analysis (MCA)

Advantages of MCA in Ensuring Comprehensive Evaluation:

- Holistic, structured comparison of scenarios
- Integrating quantitative and qualitative analysis, balancing multiple factors
- Define criteria based on objectives
- Include stakeholder perspectives
- Basis for political decision making
- Avoid extensive analysis if not needed

Objective	Indicator	Definition
Road Safety	Fatalities by all transport accidents in the urban area on a yearly basis.	Number of deaths within 30 days after the traffic accident as a corollary of the event per annum caused by urban transport per 100,000 inhabitants of the urban area.
Access to mobility services	Share of population with appropriate access to mobility services (public transport).	Percentage of population with appropriate access to public transport (bus, tram, metro, train).
Emissions of greenhouse gases (GHG)	Well-to-wheel GHG emissions by all urban area passenger and freight transport modes.	Greenhouse gas emission [tonnes CO ₂ (eq.) /cap. per year].
Air quality	Air pollutant emissions of all passenger and freight transport modes (exhaust and non-exhaust for PM _{2.5}) in the urban area.	Emission index (kg PM _{2.5} eq. per capita per year).

Example of strategic objectives with quantifiable strategic impact indicators - Source: EC GUIDELINES FOR DEVELOPING AND IMPLEMENTING A SUSTAINABLE URBAN MOBILITY PLAN

Multi-Criteria Analysis (MCA): Multi-Criteria Analysis (MCA) is a decision-making tool used to evaluate multiple competing criteria in complex scenarios. It helps in structuring and analyzing decision problems where multiple objectives need to be considered, ensuring a comprehensive evaluation of all relevant factors.

Role of MCA in Ensuring Comprehensive Evaluation:

1.Holistic Assessment: MCA allows for a holistic assessment by considering various criteria that are often conflicting. It helps in identifying trade-offs and synergies among different objectives, providing a balanced view of the potential impacts. MCA typically involves applying scores/weights to specific criteria to support the assessment task.

2.Structured Decision-Making: MCA provides a structured framework for decision-making, enabling a systematic comparison of alternatives. This structure is essential for dealing with complex urban mobility issues where multiple factors must be weighed.

3.Quantitative and Qualitative Analysis: MCA integrates both quantitative and qualitative data, allowing for a more nuanced evaluation. This integration is crucial for capturing the full range of impacts and ensuring that all relevant aspects are considered.

Application of MCA in SUMP:

1.Balancing Multiple Factors: In the context of Sustainable Urban Mobility Plans (SUMP), MCA is used to balance various factors such as environmental sustainability, social inclusivity, and economic efficiency. By evaluating these criteria

simultaneously, MCA helps in developing strategies that are well-rounded and effective.

2. Stakeholder Perspectives: MCA facilitates the inclusion of diverse stakeholder perspectives. It allows for the incorporation of input from different groups, ensuring that the final decision reflects a broad consensus. This inclusivity is vital for the success of SUMP, as it promotes stakeholder buy-in and support.

3.Scenario Comparison: MCA is particularly useful in comparing different scenarios. It enables planners to assess the relative merits of various options, taking into account the full spectrum of impacts. This comparison helps in identifying the most sustainable and beneficial solutions.

4.Objective Alignment: By using MCA, planners can ensure that the chosen strategies align with long-term urban mobility goals. MCA helps in evaluating how well different options meet the predefined objectives and Key Performance Indicators (KPIs), ensuring that the final plan is coherent and goal-oriented.

Group work!

- Exercise of 10 minutes, see the sheet distributed by your trainer



Source: <https://nypost.com/>

Group work!

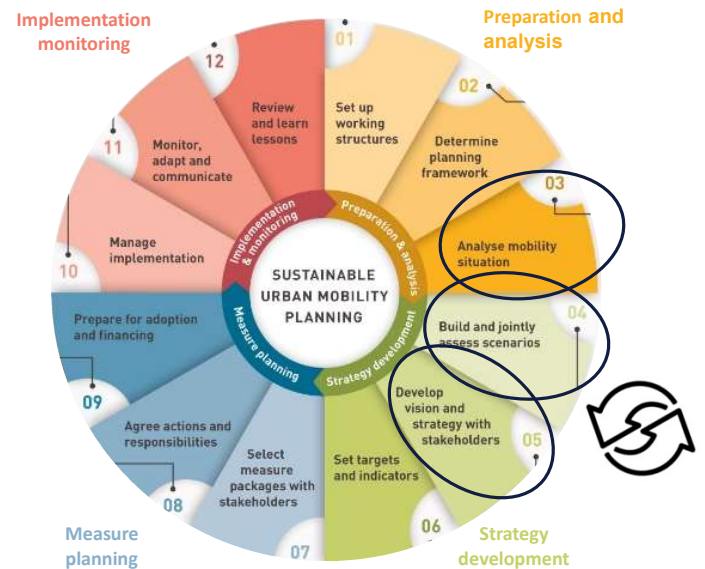
- Exercise of 10 minutes, see the sheet distributed by your trainer
- 3 groups: 1. smaller settlement, 2. mid sized city, 3. urban region, with each group two given scenarios
- Develop a simplified MCA (Multi-Criteria Appraisal) framework to assess your city area and scenarios, carefully considering what criteria to include.
- Use the simplified MCA to assess the 2 different scenarios.



Source: <https://nypost.com/>

Steps of SUMP relevant to creating scenarios

- Step 3
 - Analyse present and future problems and opportunities within the GUA
- Step 3 -> 4
 - Determine the key issues to which scenarios should provide solutions
- Step 4
 - Develop future scenarios
- Step 4 -> 5
 - Analyse results and draw conclusions



Step 3 consists of :

identify indicators / criteria (with stakeholders!)

Identify FUA

Assess your current situation

Consult stakeholders about perceived problems and opportunities

Steps 3-> 4 :

Determine the key issues to which scenarios should provide solutions

Based on assessment of current and future situation (quantitative and qualitative analysis)

Take into account input from stakeholders (e.g. specific concerns arising from interviews)

Define and communicate targets of scenarios

Step 4 involves actually building scenarios, based on forecasts. It is important to base the scenarios on the key issues from the previous step. And to ensure that it is not just about infrastructural scenarios. But the possibilities to reduce mobility in general (influencing demand) and to influence the choice of transport mode (shift from car use to bicycle and public transport use, for example) are also examined. Finally, scenarios can also be given a place in which (after influencing demand and modal shift) efforts are made to reroute transport flows.

Develop future scenarios

Based on steps before

Construct scenarios aimed at influencing mobility needs, changes in travel behavior (behavioral influence)

Construct scenarios focused on changes in mode use (modal shift between modes)

Construct scenarios focused on changes in route choice behavior (within modes of transportation)

Construct final scenarios (e.g. in several steps in multiple rounds or iterations, focusing on selection of the most promising ingredients).

After the scenarios have been built, they can then be analysed, for example with traffic models. An analysis must be made of how the scenarios score on the predetermined indicators. Based on this it is possible to draw conclusions. Then it concerns the desirability of scenarios, together with any side effects that may need to be mitigated. It may also be that certain ingredients from multiple scenarios are promising to combine into one integrated vision. This paves the way to developing a vision and an accompanying strategy.

Step 4->5: Analyze results and draw conclusions

Use a multi-modal traffic model for comparison of the effects of scenarios

Based on defined indicators and criteria

Use qualitative and/or quantitative methods of scenario evaluation.

Use the MCA

Draw conclusions on the effects of influencing mobility needs, modal shift opportunities and route choice behavior

Construct a resulting integration scenario from the most relevant elements from the previous analysis scenarios
= input for vision development

Keep in mind that the final goal is to derive at a preferred strategy/option on which to further elaborate organisational, operational and infrastructure measures....

Use of multi-modal transport modelling

- Models help decision making with quantitative analysis
- Impact Estimation: models are able to estimate demand and associated impacts of both BAU scenario and alternative options in terms of trends / key indicators.
- Tool, not oracle: models simplify reality and need to be used in the right way and context.
- Quality of output depends on the quality of input data.
- Fit for purpose: excessive modelling sophistication may be counterproductive ('lots of data, few insights').
- Not only modeling congestion but also quality of life (requiring multimodal modeling)
- Challenges: new trends and innovations: e.g., shared mobility, home working, capacity reductions...



Transport models: simplified representations of transport supply and demand and their interaction in a given context (e.g., mobility within a city). Transport models are built to simulate the effect of modifications of such existing conditions and thus to give insight in result of choices" – see training module 9 (Demand and accessibility analysis) for more information

- **Objective Analysis:** Transport models play an important role in informing decision making by providing quantitative assessment and results. By using these models, stakeholders can better understand the potential impacts of various transport policies and projects. It is important to note that while network models are often crucial tools to inform a SUMP, valuable demand analysis can also be carried out with help of more basic tools and calculations, based on available data and from day one of SUMP elaboration.
- **Impact Estimation:** Transport models will help to inform and assess (& estimate the impacts) of both the Business As Usual (BAU) scenario and alternative options in terms of trends and key indicators. By simulating different socio-economic forecast scenarios, models can predict how changes in population, economic activities, or infrastructure developments might affect urban mobility.
- **Tool, Not Oracle:** It is important to recognize that transport models are tools designed to simplify reality and are not infallible predictors of the future. They are based on numerous assumptions and exogenous conditions that can affect their accuracy. As such, models should be used as guides rather than definitive answers. Modelling tools should also be used to assess the system's current performance rather than solely focus on forecasts, hence informing the SUMP problem analysis (diagnose) phase.
- **Input Quality:** The quality of a transport model's output is directly related to the quality of its input data. High-quality, accurate data is essential for producing reliable and meaningful results. Ensuring robust data collection and validation processes is critical for effective transport modelling.

- **Fit for purpose:** excessive modelling sophistication may be counterproductive. While certainly requiring quantitative demand analysis, a fully fledged multimodal network model is unlikely to be required in small town / rural area SUMP.
- **Challenges with Innovation:** Innovative mobility solutions, such as shared transportation modes and Mobility as a Service (MaaS), present unique challenges for transport modelling. These solutions often involve new and dynamic variables that traditional models may not fully capture. Therefore, continuously updating and adapting models to integrate these innovations is necessary to maintain their relevance and accuracy.
- **Timescales:** when the SUMP work includes building a transport model from scratch, it should be ensured that demand analysis is carried out in a timely manner to inform the problem analysis (diagnose) leading to the formulation of SUMP objectives. Given the usual time that is required to build a new transport model, a two-tier process might be required, whereby more basic analysis based on data and calculations is initially done, to be followed and qualified by more detailed analysis with the network model (when validated and ready for use). Ideally, there should be an available network model to inform the work on complex SUMP, avoiding gaps in the analysis or unnecessary delays.

Conclusion: How to build a multi-modal plan scenario in SUMPs?

- In the **Greater Urban Area (GUA)**, defined at system (not project) level.
- Ensure potential to **meet SUMP objectives** (both policy related and associated with identified local issues).
- Planning **coherent, hierarchical, integrated** multimodal network and operations. Ensure **seamless network / service integration** across **all modes, sectors and transport levels**.
- Also non infrastructural ingredients: operations (service integration across all modes, sectors and transport levels), demand management, land use planning
- Engage **stakeholders (including the public) early** in the SUMP process. Utilize feedback to refine mobility solutions.
- Use **robust assessment tools** for selection of scenarios. Combine qualitative and quantitative methods for **scenario evaluation**. Consider **MCA** for **holistic assessment**.