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Overview of Urban Mobility Climate Mitigation Strategies and Climate objectives in Urban Mobility Plans (SUMPs)

Final Report
Zurich / Stuttgart, 6 January 2022

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Executive Summary

This study provides an overview of how European cities are implementing climate change mitigation strategies in the transport sector – in Sustainable Urban Mobility Plans (SUMPs) or Urban Climate Mitigation Strategies. Based on a comprehensive screening process and with the support of EIB/JASPERS staff, a set of 13 case studies was selected for in-depth analysis.

First, a broad screening of SUMPs and urban climate mitigation strategies has been conducted with around 190 urban strategies. This broad screening shows that less than half of the strategies have quantitative climate targets for mobility. This analysis also shows that there are some structural differences by city size, year of approval and region.

The aim of the report is to derive lessons and conclusions from the case studies, in particular with regards to the way climate targets for urban mobility are addressed, how climate strategies and SUMPs are aligned with each other and with overarching strategies, what methodologies and targets are applied, and what key measures are identified to achieve the climate targets in mobility.

The case studies are based on extensive desk research and interviews with local experts. For each city or metropolitan area, a short summary is provided focusing on the quantitative climate targets for mobility, the alignment of the targets and the strategy with the overall objectives, the interaction and alignment of the SUMP with the local climate change strategies, the ex-post monitoring and the key actions of the strategies. Success factors, shortcomings and obstacles were identified.

Based on the findings of the case studies, the report provides recommendations on how to address climate change in future urban mobility planning. Instead of forecasts for future growth, a backcasting approach is needed, where future emission ceilings are set as targets.

Content

1. Background and goal

Background of the study

At the municipal level, strategic planning in the transport sector in European cities has been carried out for years with the help of transport development plans and transport or mobility strategies (e.g. Sustainable Urban Mobility Plans: SUMPs). Within these plans and strategies, environmental and climate policy issues have also been addressed.

In recent years, cross-sectoral climate strategies and plans (e.g. also "net zero strategies") have gained relevance in cities, especially with the emerging relevance of climate issues. Due to its relevance on the municipality level, the mobility sector is generally an important part of these strategies. This raises the question of the delimitation of these two instruments, possible synergies or overlaps (or even trade-offs). Another important issue is the question of the impacts of SUMPs and their measures on the one hand and the urban climate strategies in the mobility sector on the other hand. Do these strategies and measures have the impact assumed and are the impacts analysed (evaluation, impact analysis)?

Based on this situation and the arising questions, the European Investment Bank EIB / JASPERS would like to have investigated these different questions in more detail. The EIB has commissioned a "preliminary study" to analyse the issues raised above on urban mobility plans and urban climate strategies in Europe. This preliminary study shall be a basis for a possible further deepening of the topic in further analyses.

Objectives

The *overall objective* of the mandate is to provide an overview of how European cities address climate change mitigation strategies in transport – either in SUMPs or in urban climate strategies. The focus is on the EU-27, possibly complemented with insights from other European countries. This main goal is to be achieved with the following *sub-goals*:

- Develop an overview of how and within which strategic instruments climate-related transport policies, concepts and strategies are implemented in European cities.
  This overview should consist of two parts, focussing each on the type of strategy:
  a. Overview on urban climate strategies in Europe – with a focus on how they address climate change mitigation of urban mobility. The focus of the analysis is mainly on Sustainable Energy and Climate Action Plans (SECAP, see chapter 2.1 below).
  b. Overview on SUMPs in European cities – with a focus on how they address climate change mitigation objectives.

- Identification of good examples ("best practice") of such strategies – and generally best practices of addressing climate change mitigation objectives in urban strategies (SUMPs and urban climate strategies).
- Gaining additional insight of best practices through in-depth analysis of a number of case studies for selected cities.
- Derive learnings and conclusions from the best practice examples and case studies, especially with regard to the following issues: the way the two instruments (cross-sectoral urban climate strategies and SUMPs) address climate change mitigation objectives in urban mobility , how they are aligned with each other and with national climate plans, namely the NECPs, which methodologies and targets are applied, which key measures are determined to achieve the targets.

2. Scoping and approach

2.1. System boundaries and scope of the analysis

The present study covers the following **system boundaries**:

- Type of strategies to look at:
  - urban climate (mitigation) strategies: focus mainly on SECAPs[1]. In selected cases also other cross-sectoral climate mitigation strategies or net zero strategies are included.
  - urban mobility strategies: focus on SUMPs (and not on any other type of mobility strategies)
- Specific focus: Looking at SUMPs, a specific focus is on SUMPs which address climate (mitigation) objectives explicitly. Looking at urban climate strategies, the focus is on strategies that cover mobility issues comprehensively.
- Geographical focus: The analysis includes all EU-27 countries, plus other relevant European countries. There is no focus on specific regions or countries. The sample of strategies and plans should try to cover Europe representatively (including possible client regions of JASPERS advisory activities).
- Size of cities/agglomerations: The main focus lies on urban areas with more than 100’000 inhabitants. However, if there are interesting and exemplary cases of smaller agglomerations, these projects are to be considered in the analysis as well.
- The focus is on the functional urban areas, including core cities and agglomerations (if possible / information available).

[1] SECAP: Sustainable Energy and Climate Action Plan. SECAP is the newer type of strategy, see chapter 3.1.3. Earlier, this type of strategy was called SEAP: Sustainable Energy Action Plan.

Scope of analysis

The focus of the analysis is on the following issue/topic:

- Urban mobility strategies, concepts and measures – and their connection to climate mitigation targets and climate mitigation measures:
  a. How do urban climate strategies (focus: mitigation, → SECAPs) cover mobility issues?
  b. How do sustainable urban mobility plans (SUMPs) cover climate mitigation issues?
- Overview and delimitation of local climate strategies and SUMPs (interrelation between both, hierarchies, sequence, details, overlaps, trade-offs)
- In the end, the analysis shall also include suggestions on how to improve SUMPs in order to cover climate issues on mobility in urban areas adequately on a strategic level.

2.2. Methodological approach

In line with the terms of reference and the offer, the study is based on the following working steps:

- Working step 0: Kick-off meeting, definition of system boundaries and scope of the analysis
- Working step 1 (in parallel with step 2): Overview on urban climate change strategies in Europe (focus on mobility issues), → SECAPs
- Working step 2 (in parallel with step 1): Overview on urban mobility plans (→ SUMPs) in Europe (focus on how they handle climate objectives)
- working step 3: Identification of best practice examples
- working step 4: Case studies

As a parallel and also final working step, the report is written, including all results of the study as well as the main conclusions.

Methodology for working step 1, 2 and 3

The main aspects and research questions of the analysis in working step 1, 2 and 3 are the following:

- What types of climate plans are implemented in European cities (e.g. Local Climate Action Plan, internationally induced plans such as SEAP or SECAP)?
- What is the EU climate and energy framework? EU-wide targets and policy objectives for climate mitigation and mobility (most recent: “fit for 55”)
- What is the SEAP and SECAP methodology – with focus on mobility?
- Quantitative analysis of SUMPs: illustrative overview on which regions, cities, countries mainly have SUMPs

- Qualitative analysis of SUMPs and climate strategies: Overview on which cities and city types have such strategies (climate strategies or SUMPs), including basic information per strategy (see criteria an Annex A1 and A2)
- Selection criteria for qualitative analysis of SUMPs: are climate mitigation targets/objectives (not only hard targets, also e.g. monitoring strategies) explicitly mentioned?
  → Focus on SUMPs that clearly address climate mitigation issues

All these questions are to be seen in the broader context of the two main research questions:
a. How do urban climate (mitigation) strategies (SECAPs) cover mobility issues?
b. How do sustainable urban mobility plans (SUMPs) cover climate mitigation issues?

To analyse the aspects above the following methods have been applied:

- Desk research: The main method was a comprehensive desk research on existing literature, studies, websites, and databases with examples of SUMPs and urban climate strategies (SECAPs) related to mobility. The detailed steps of the desk research are described below.
  An important source of information has been the different networks including: Covenant of Mayors (for Climate & Energy of Europe), Eltis (The Urban Mobility Observatory), Eurocities and POLIS.
- Selected interviews with experts: additionally, selected experts are being involved by short mail survey/questionnaires (e.g. from EIB/JASPERS, DG CLIMA, DG MOVE, DG REGIO) as well as with practitioners from networks and cities.

The **desk research** has been conducted in different steps:

- literature analysis
- analysis of databases and concrete strategies
- For SUMPs the analysis is conducted as following (see scheme in Figure 1):
  - broad screening of a larger number of SUMPs to gain a quantitative overview on the following issue: SUMPs with quantitative climate objectives (for mobility): yes/no, concrete targets, reference of targets. In total, 168 SUMPs have been covered in that broad screening (see chapter 4.3.1 for details).
  - quantitative analysis of the SUMPs screened: analysis by city size, country and region, year of approval.
  - in depth-analysis of a selected number of SUMPs, including type of measures, status quo analysis, climate objectives, monitoring, etc. The analysis has been made on the basis of a set of criteria (see Annex A1).
    Until now (interim report), the in-depth analysis covered 12 SUMPs.

- For urban climate strategies (SECAPs) the analysis was done as following:
  - Analysis of the type of urban climate strategies that exist. It was then decided to further focus on SECAP (Sustainable Energy and Climate Action Plan) and SEAP (Sustainable Energy Action Plan).
  - In contrast to the SUMPs, there has not been conducted a broad, quantitative screening, but directly a more in-depth analysis of the climate mitigation strategies (SECAPs). The analysis has been made on the basis of a set of criteria (see Annex A2), which was similar to the criteria for SUMPs. In total, 23 urban climate strategies (SECAPs) have been analysed.
- Based on the screening and more detailed analysis of the SUMPs and urban climate strategies, a short list of possible good practice examples of strategies/cities has been identified. The strategies from the list of good practice examples can be further analysed (whole strategies of certain aspects of the strategies) and are also the basis for choosing examples for the case studies.

Figure 1: Methodology for analysis and screening of SUMPs

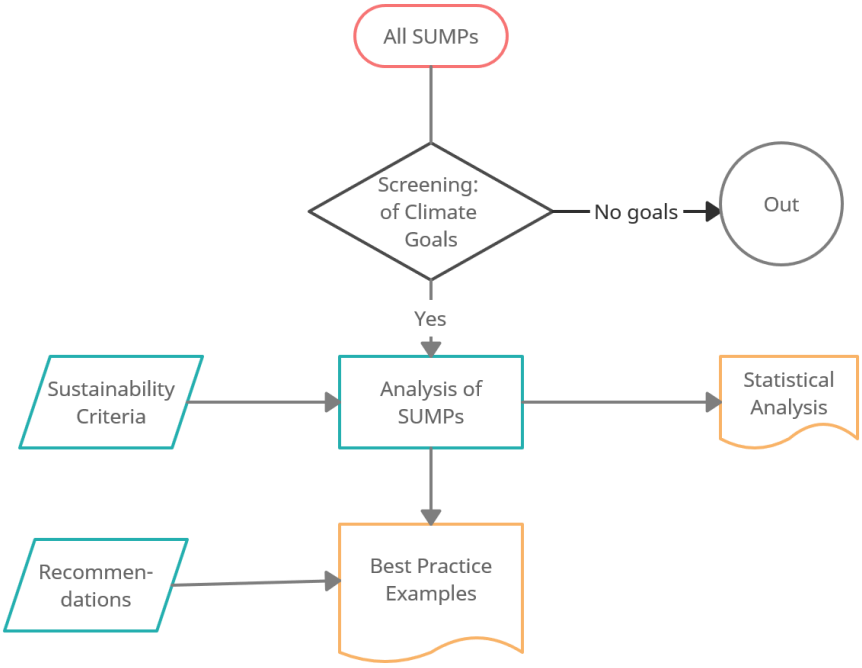


Figure INFRAS.

Case studies: The methodological approach for the case studies (working step 4) includes literature analyses (strategy documents) and personal interviews and is described in chapter 5.1.

3. Urban climate strategies – with focus on mobility

The chapter first provides a brief description of the EU's current climate change mitigation policies and strategies. It then describes the EU targets and strategies specifically for the transport sector. Then, European emissions from the transport sector are examined in more detail. Finally, the chapter gives a brief overview of the climate objectives of a selection of SECAPs/SEAPs in European cities.

3.1. Introduction to climate mitigation strategies and targets in Europe

3.1.1. EU climate framework

The European Union’s long-term strategy is to be carbon neutral by 2050, which means to become an economy with net-zero greenhouse gas emissions by 2050. This objective is in line with the Paris Agreement and the European Green Deal. The key climate and energy targets are defined in the 2020 climate and energy package and the 2030 climate and energy framework. Table 1 summarises the key targets of both frameworks.

Table 1: EU key energy and climate targets

2020 climate and energy package	2030 climate and energy framework
▪ 20% cut in GHG emissions (from 1990 levels) ▪ 20% of EU energy from renewables ▪ 20% improvement in energy efficiency	▪ At least 55% cuts in GHG emissions (from 1990 levels) ▪ At least 40% share for renewable energy ▪ At least 35-39% improvement in energy efficiency

3.1.2. National energy and climate plans

EU climate policy guides both regional and national efforts for climate mitigation and adaptation. The EU countries were obligated to set up a 10-year integrated national energy and climate plan (NECP) for the period between 2021 and 2030. The draft plans needed to be submitted to the Commission by the end of 2018, while the final plans were due by the end of 2019. Furthermore, the EU countries were committed to establish national long-term decarbonisation strategies by the beginning of 2020 complementing the 10-year NECPs. The NECPs need to give an overview on how the Member States intend to address the first phase of the transition towards climate neutrality.

In 2020, the Commission published an assessment of the cumulative impact of the 27 NECPs. The assessment shows that more than the 2030 greenhouse gas emissions reduction target of

40% can be achieved by the full implementation of the plans. Thus, as the impact assessment implies, the NECPs provide a solid base to aim at a higher greenhouse gas emissions reduction target for 2030. In July 2021, the Commission raised the greenhouse gas emissions reduction target to at least 55% below 1990 levels by 2030 according to the European Green Deal.

3.1.3. Local climate plans

Cities and its agglomerations are crucial in climate change mitigation and adaptation efforts. In order to fulfil this role, urban areas need to develop and implement local climate plans containing policies tackling climate change mitigation and adaptation.

In 2008, the EU Covenant of Mayors was launched by the European Commission to convene local and regional authorities voluntarily committed to implementing EU climate and energy goals. The signatories endorse a shared vision of 2050 and pledge action to support the EU climate targets.

Before 2015, the Covenant of Mayors addressed only energy and climate mitigation (at least 20% emission reduction target by 2020 compared to the baseline). The signatories were committed to prepare and implement a Sustainable Energy Action Plan (SEAP) tackling the largest emitting activity sectors before 2020. In 2015, the Covenant of Mayors and its sister initiative Mayors Adapt have joined forces. The new Covenant of mayors has integrated Mayors Adapt and is addressing not only climate mitigation, but also climate adaptation. Thus, the signatories are committed to prepare and implement a Sustainable Energy and Climate Action Plan (SECAP) including climate mitigation (at least 40% emission reduction target by 2030 compared to the baseline) and climate adaptation strategies. Both SEAPs and SECAPs include:

- baseline emission inventory assessing the current situation
- clearly identified goals and targets
- measures planned together with time frames, assigned responsibilities and estimated impacts

The Guidebook on how to develop a SECAP provides the signatories with a set of methodological principles, procedures and best practices for developing a SECAP. Figure 1 illustrates the steps and process behind developing and implementing a SECAP.

Figure 1: The SECAP process

Figure INFRAS. Source: Covenant of Mayors

3.2. Climate change mitigation in the transport sector

3.2.1. EU targets in the transport sector

While SEAPs and SECAPs focus on energy efficiency and sustainable production, Sustainable Urban Mobility Plans (SUMPs) are the most important instrument promoted by the European Union to foster sustainable mobility and climate mitigation (and adaptation) policies at the local level. A SUMP is a strategic and integrated plan with the goal of improving accessibility and quality of life by achieving a shift towards sustainable mobility. Although from different perspectives, both plans ultimately concur to the same objectives: the reduction of pollutant emissions and the promotion of sustainable urban development. The strategies can influence each other – and a harmonised planning could maximise synergies and complementarities.

The departments of energy and mobility in cities are usually under the responsibility of different political decision makers within a local authority. Consequently, local authorities often develop separate policies and measures concerning climate and mobility issues, lacking a common strategic vision and coordination. This lack of harmonisation between strategies can lead to discrepancies in timeframes, definition of indicators, targets and inefficiencies in data monitoring. The integration of the development of SUMPs and SECAPs on municipality level could create synergies and minimise existing differences.

The White Paper on transport of 2011 set long-term goals for the European transport industry. By 2050, a reduction of at least 60% of greenhouse gas emissions with respect to 1990 is

required for achieving the goal of limiting climate change below 2°C. Furthermore, the White Paper recommended a 20% reduction in transport emissions (excluding international maritime transport) between 2008 and 2030. It also sought a 50% shift away from conventionally fuelled cars in urban areas by 2030 with the goal of phasing them out completely by 2050. However, these objectives fall short of the objectives set by the Paris Agreement. The action plan known as European Green Deal proposed by the Commission sets the reduction target to 90% in transport-related greenhouse gas emissions by 2050.

In 2020, the Commission presented a Sustainable and Smart Mobility Strategy setting a roadmap for a sustainable, smart and resilient European transport and mobility sector. The strategy is complemented by an action plan of 82 initiatives and 10 flagship areas. The scenarios underlying the strategy show that the targets set by the European Green Deal can be achieved with a combination of proposed policy measures.

With the "Efficient and Clean Mobility package", the Commission adopted on 14 December 2021 four proposals to modernise the EU transport system in line with the objectives of the European Green Deal, based on the Action Plan of the "Sustainable and Smart Mobility Strategy" (see above). The package aims to make urban mobility more sustainable, smarter and healthier. The new Urban Mobility Framework is part of this new initiative and includes a more ambitious approach to sustainable urban mobility planning and associated indicators. In addition, the revised TEN-T regulation requires the 424 largest EU cities in the TEN-T network to prepare a SUMP and collect relevant data.

3.2.2. Actual performance in the transport sector

When looking at Figure 2 developed by EEA, the dilemma of GHG emissions from transport in the EU becomes apparent. While most the other sectors reduced their emissions, the transport sector increased the output of CO_2 by 33% since 1990. González et al (2019) provide evidence for 13 European countries that CO_2 emissions from cars have benefited from global technological progress and changes in average fuel efficiency, while increases of economic activity, motorization rate and the dieselization process hold positive and significant relationship with car CO_2 emissions.

Figure 2: Greenhouse gas emissions by aggregated sector

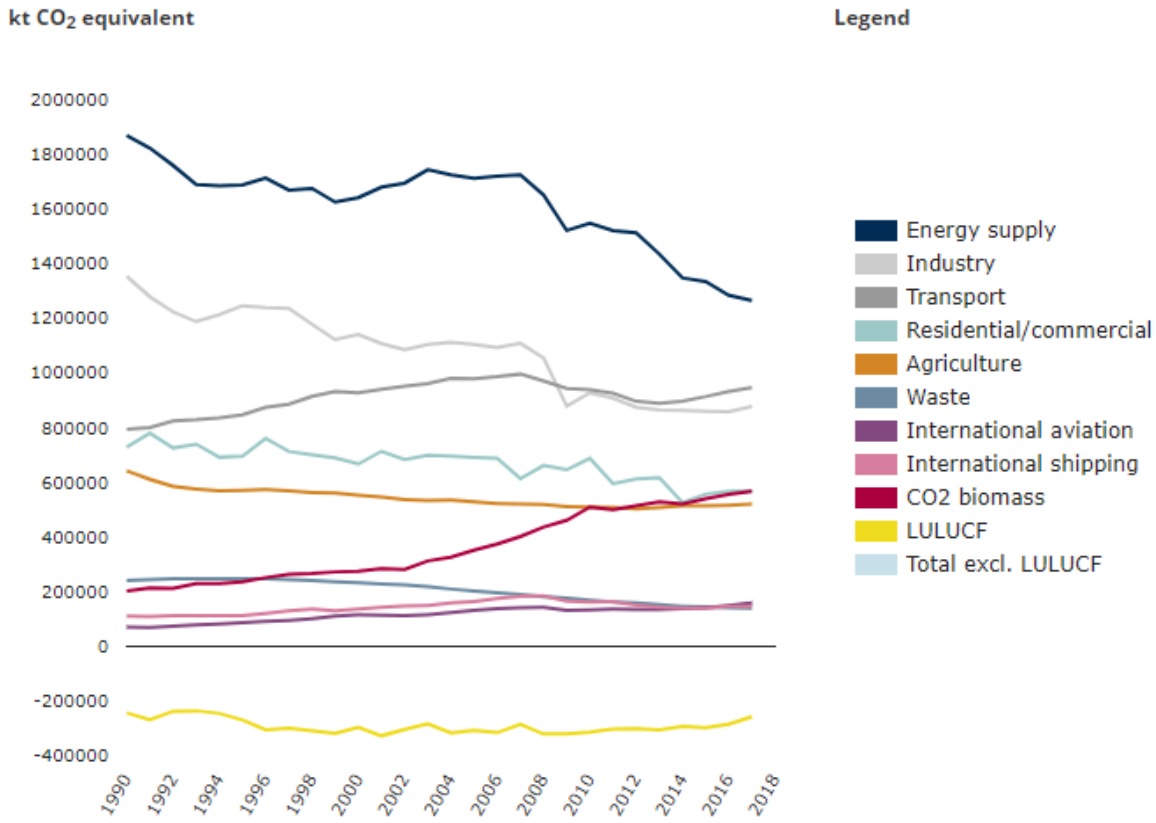


Figure INFRAS. Source: EEA.

This is in diametrically opposed to the EU Commission's new goals of reducing GHG emissions by 55% in 2030 and completely decarbonising transport in 2050. This target implies that emissions from transport need be curbed and, arithmetically, decreased annually by more than 10 % to reach the 55 % reduction goal until 2030. This is a tremendous task – considering the past performance of the sector. The drama is even amplified when the planned GHG mitigation measures are assessed that contribute by far not enough to solve the problem in the future. Even additional measures evaluated by EEA are not complying with the EU target. The graph in Figure 2 and Figure 3 show clearly that a *complete turnaround in transport policy and planning is needed*. The EU Commission (2020, p.2) consequently demands that "we must shift the existing paradigm of incremental change to fundamental transformation". The commission plans to incentivise good examples of cities on their way to carbon neutrality.

Figure 3: Greenhouse gas emissions from transport in the EU 1990 -2050

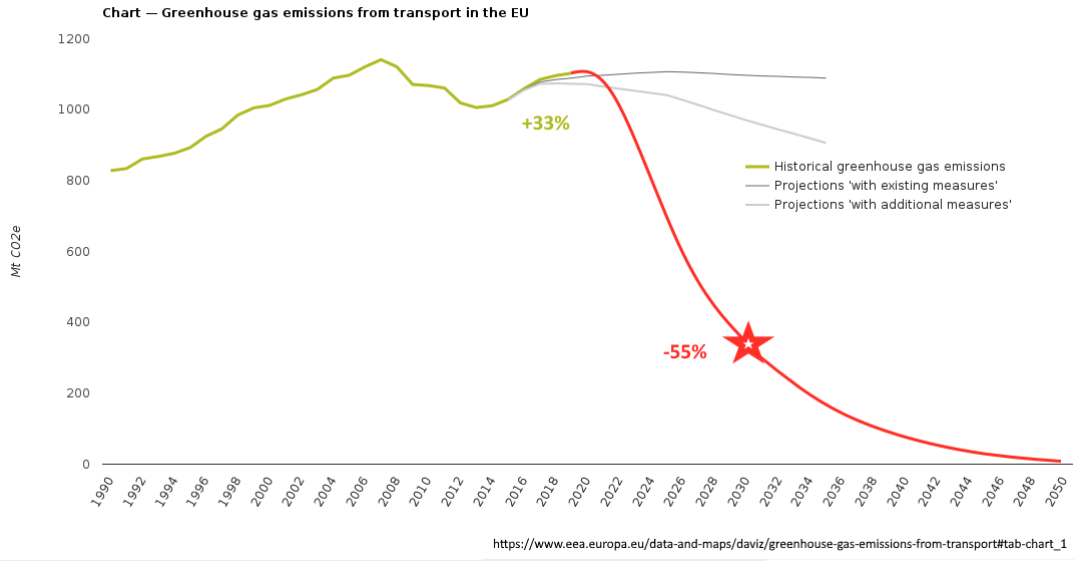


Figure INFRAS. Source: EEA

One of the most important causes for the development is the rapidly growing car fleet in Europe, which has increased by one quarter between 2000 and 2017[2]. One of the reasons is the process of catching up of eastern European countries with the western countries[3]. However, this cannot explain the entire increase in GHG emissions. The failure of national, regional and local (urban) transport strategies in meeting climate targets, which will be explained further down in the text, is due to another reason.

3.3. Overview on urban climate mitigation strategies in Europe with focus on mobility

3.3.1. Analysis of climate strategies in the EU

The following section is based on the analysis of a sample of urban climate mitigation strategies[4]. The analysis focuses on Sustainable Energy and Climate Action Plans (SECAP). Those SECAPs are not urban climate action plans by exclusive definition, but their cross-sectoral character (climate and energy incl. mobility issues) makes them the most relevant planning tool focussing in a

[2] https://www.eea.europa.eu/data-and-maps/indicators/size-of-the-vehicle-fleet/size-of-the-vehicle-fleet-10
[3] EUROSTAT (2013) Regional Yearbook.
[4] Strategies were selected pragmatically based on availability on the Covenant of Mayors website and city size. It was ensured that cities of different sizes and different countries were included.

comprehensive way on climate issues at local (urban) level. SECAPs from 23 cities of 13 European countries (see list in Annex A4) were screened and investigated. The city size of the considered cities ranges from 65'000 to 3'645'000 inhabitants. Nine cities are below 250'000 inhabitants, ten cities between 250'000 and one million inhabitants and four cities above one million.

A total number of 14 SECAPs (ca. 60%) include clear quantitative climate mitigation targets for mobility, 3 SECAPs mention quantitative goals in terms of modal split targets, whereas 6 strategies (one quarter) do not have any quantitative targets for mobility.

The 14 SECAPs with quantitative climate targets intend to achieve the targets with the following type of measures:

- 10 strategies plan to enhance non-motorised transport (walking, cycling tracks, cycling network, cycling highways)
- 8 strategies plan to enforce alternative (fossil-free) road transport technologies
- 9 strategies want to improve their rail and bus network
- 7 strategies intend to manage transport demand with sharing services, P+R Parking, low-emission zones
- Other measures are for example: a free transport day, a mobility week, efficient driving courses, or installing speed limits in passenger cars

As mentioned above, mobility issues are addressed inconsistently in SECAPs. Most strategies with quantitative targets for mobility set general emission reduction targets (e.g. Strovolos, Bologna, Parma, Bacău, Sagunto, and Gothenburg). A few strategies set specific modal split targets (e.g. Vienna, Frankfurt am Main, and Budapest), others only mention qualitative objectives (e.g. Berlin, Prešov and Bremen). Almost all investigated SECAPs are referring to overall climate objectives, mainly on the targets at EU and national (NECP) level. For around half of the strategies analysed, a quantitative analysis of the impact of the measures (and hence the target achievement) is foreseen.

In the following, some of the SECAPs analysed are described in more detail, focussing on the most interesting aspects.

Berlin's climate objective is to become climate neutral by 2050. To achieve this goal, the total amount of CO_2 emissions needs to be reduced by at least 60% by 2030 and 85% by 2050 (below 1990 levels). Despite these quantified climate targets, Berlin's climate strategy (i.e. SEAP) has no quantified emission targets for the transport sector. The strategy contains several transport measures and the related implementation strategies to reduce CO_2 emissions without stating

their expected effects. Similarly, the SECAP of the (small) city of *Prešov* (Slovakia) neither contains quantified climate targets for transport nor the expected quantified impacts on emissions of the planned transport measures.

The climate strategy of *Budapest* sets quantified targets for the transport sector in terms of modal split targets. By 2030, the modal split in Budapest is supposed to be as follows: 50% public transport, 20% car, 10% bike and 20% pedestrian. The measures to achieve this goal are only vaguely described and the plan contains no quantification of the expected impacts on emissions nor an overall climate target for the transport sector. *Frankfurt am Main* compares in its climate strategy an action scenario (2050) to a reference scenario (2010). The plan shows that with the appropriate measures the use of public transport and bicycles can be increased substantially whereas the use of cars can be decreased. The SEAP of Frankfurt does not contain any specific climate targets for the transport sector.

Gothenburg has a SECAP that quantifies climate targets for the transport sector: reducing climate impact of transport by at least 90% by 2030 compared to 2010 level. This shall be achieved by reducing motorised road transport demand by 25% by 2030 compared to 2020 and a strong shift towards fossil-free fuelled vehicles. The overall climate objectives of the strategy (at least 10.3% emission reduction per year, which corresponds to an 80% reduction between 1990 and 2030) are in line with the regional targets of climate and relate to the geographical area Gothenburg. Similarly, *Stockholm* sets climate mitigation targets for the transport sector in their climate strategy: 70% reduction of GHG emissions from transport by 2030 and a fossil free transport sector by 2040. The climate target for transport is derived from the national target. The overall climate objective of Stockholm is also in line with the EU climate targets and the NECP of Sweden. The strategy declares for every planned measure its expected impact on CO_2-equivalents emissions and the responsible authority for its implementation and follow-ups. The transport measures included in the strategy are cycling tracks, sharing services, parking management, densifying housing close to public transport, improvement of bus network, and shift from truck to boat in freight transport.

The climate objective of the small city of *Strovolos* (Cyprus) is to reduce CO_2 emissions by 42% by 2030 compared to 2009. For the transport sector, the strategy sets a climate target of 18'037 t CO_2 reduction per year. The planned transport measures to achieve these quantified climate target include facilitating walking, cycling, and sustainable mobility neighbourhoods. Furthermore, the plan contains measures to enhance the bus network and the light rail network. To promote sustainable mobility the city plans a free public transport day and a mobility week. The plan of action includes the cost, the period of action, the responsible authority, and the expected impact on CO_2 emissions for the respective measure.

Some cities refer to a SUMP in their SECAP/SEAP to account for the mobility sector in their climate strategy (e.g. Parma, Pesaro, Sagunto, Bacău, and Prešov). For instance, *Parma* sets a climate mobility target of 48.9% CO_2 emission reduction in the transport sector by 2030 compared to 2004. For a detailed description of the measures to be taken to achieve this climate mobility target, the SECAP refers to the SUMP of the city. However, even though the SECAP of Parma clearly states a quantified emission reduction target for the transport sector, the SUMP does not quantify the impacts on CO_2 emissions of the planned measures.

In the forthcoming working step, the following issues will be addressed in more detail:

- mobility measures and issues foreseen in the SECAPs (more detailed analysis)
- interaction of local transport policy making and urban climate strategies: interaction of SECAPs/SEAPs with the SUMPs; possible alignment of the SECAPs/SEAPs with SUMPs (e.g. targets/objectives, measures, etc.).
- monitoring and ex-post evaluation of the impact of the measures.

Potential good practice examples

Based on the first analysis of urban climate strategies with the focus on mobility, a first set of possible good practice examples of cities is being identified. The following short-list is further elaborated when selecting and analysing the case studies (see chapter 5.1). There, the list will also be extended and aligned with the suggestions of the SUMP analysis (see section 4.3).

Potential good practice examples of urban climate strategies (SECAPs):

- Stockholm
- Parma
- Bologna
- Toulouse
- Dresden
- Stuttgart
- Zurich
- Smaller cities (below 100’000 inhabitants): Pesaro (IT), Strovolos (CY)

4. Urban mobility plans (SUMPs) – with focus on climate issues

This chapter sets out the importance of local transport strategies in climate change mitigation. It also provides a brief introduction to Sustainable Urban Mobility Plans (SUMPs). In addition, this chapter presents the results of a comprehensive screening of 168 SUMPs from different European cities. Finally, a methodology for integrating climate mitigation objectives into SUMPs is proposed and a brief overview of the existing literature on the subject is provided.

4.1. The importance of local transport in Europe

Generally, the public perception of transport is focussing on high speed trains, airplanes, motorways which represent features of long-distance transport. The importance of transport in and around the residence may be assessed if the average trip length in selected European countries is observed which varies between 7.2 km Switzerland and 15.8km in Sweden (JRC 2013). Germany may be regarded as representative since it is situated in the middle between the examples. An analysis of transport patterns revealed, that half of the trips are shorter than 3.9 km and 54% of the transport volume, measured in passenger kilometres, are below 50 km[5]. Evidence from Baden-Württemberg, Germany shows that more than 55% of all daily commuters move within the boundaries of their municipalities.

Country	Average trip length [km]
Cyprus	10.4
Germany (MiD)	11.5
Italy (ISFORT)	12.2
Latvia	8.7
Sweden	15.8
Switzerland	7.2
Source: Joint Research Centre 2013	

[5] Own analysis of MID 2017

Figure 4: Trip length and transport volume in Germany 2017

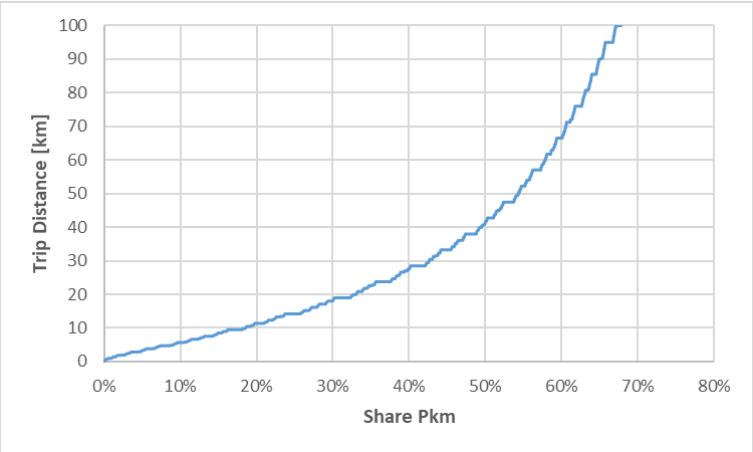


Figure INFRAS. Source: Own calculations based on MID 2017.

A large majority of European citizens live in an urban environment, with over 60 % living in urban areas of over 10 000 inhabitants. **Urban mobility accounts for 40 % of all CO_2 emissions of road transport[6].** This share would increase considerably, if the traffic from suburbs and rural areas commuting into the centres are added. In Germany, the share of commuters leaving the community to work in another municipality amounts to 60%[7] Consequently, a regional approach is imperative for the assessment of urban transport.

To resume, the importance of local transport in and around the municipalities cannot be overemphasized when analysing climate impacts of transport. Additionally, local policy makers have a large influence on the sustainability of the transport system. Municipalities can significantly influence local traffic because they have the planning authority over the distribution of public areas, parking space management, local traffic planning and traffic control. On the communal level it is decided who owns how many cars, whether bicycles are only recreational equipment and who buys a season ticket for buses and trains.

4.2. Introduction to Sustainable Urban Mobility Planning

The Commission's Urban Mobility Package (COM(2013) 913 final, ANNEX) set out a concept for Sustainable Urban Mobility Plans SUMP that emerged from a broad exchange between stakeholders and planning experts across the European Union. Member States are encouraged to promote SUMPs at the national level, and to provide their local authorities with adequate support and

[6] https://ec.europa.eu/transport/themes/urban/urban_mobility_en
[7] https://www.welt.de/wirtschaft/article138011400/Deutschland-ist-die-Republik-der-Pendler.html

legislation. The revised Urban Mobility Package of 14.12.2021 has not altered those basic stipulations.

> "A Sustainable Urban Mobility Plan is a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on existing planning practice and takes due consideration of integration, participation, and evaluation principles."

While the original concept still stands, the Guidelines for developing and implementing a Sustainable Urban Mobility Plan have been revised and a comprehensive documentation[8] established that shall only be shortly resumed here. The following main principles describe the general approach towards SUMPs:

Figure 5: Eight principles for the development of SUMPs

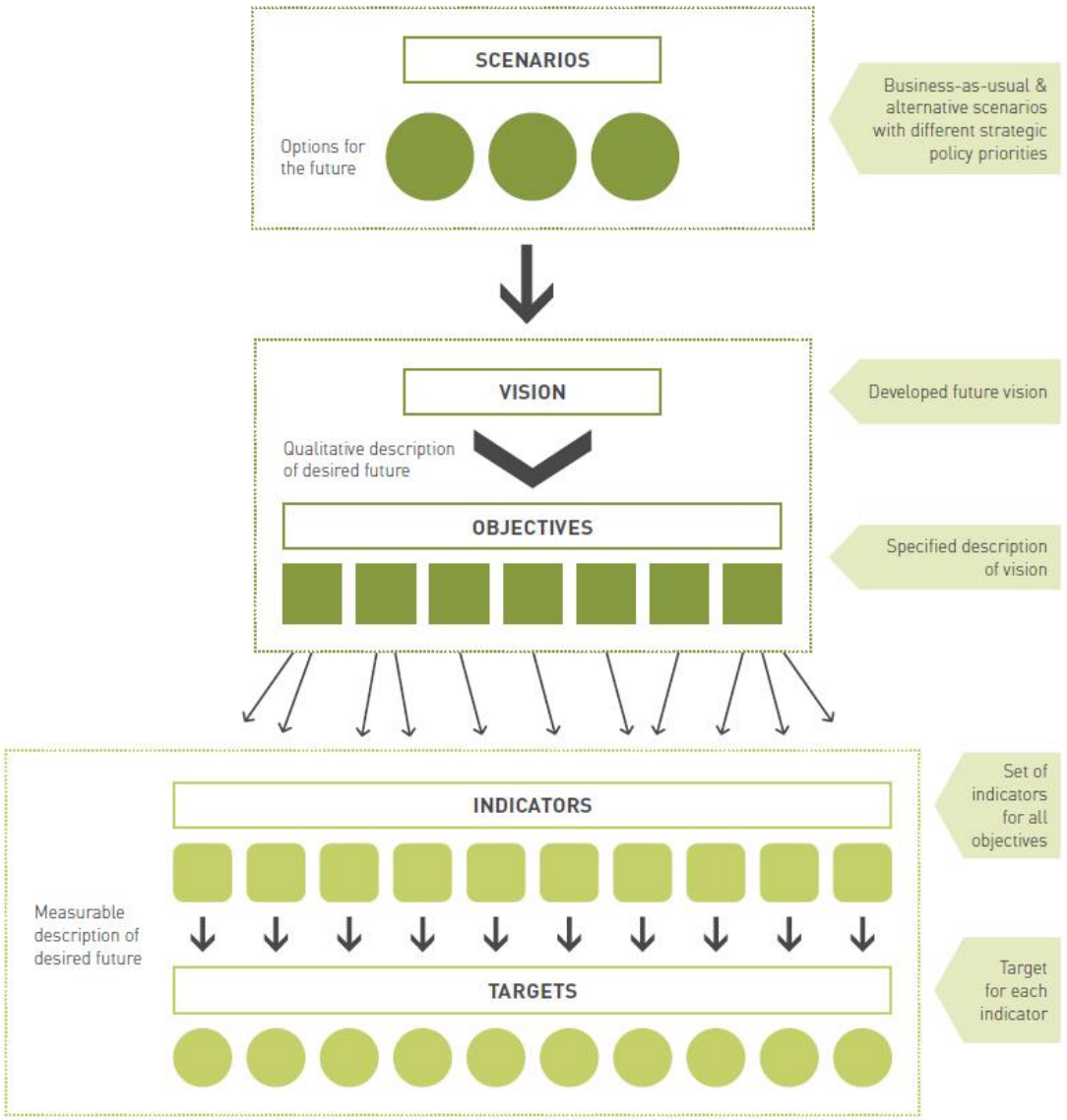
Source: https://www.eltis.org/mobility-plans/sump-concept

[8] https://ec.europa.eu/transport/themes/urban/urban-mobility/urban-mobility-actions/sustainable-urban_en, https://www.eltis.org/mobility-plans/sump-concept,

The planning process comprises three stages and 12 steps. Starting with preparation and analysis of the present situation, continuing with strategy development, followed by the measure planning (transport interventions) and finally with Implementation and monitoring.

For this study, the process of defining measurable targets is of major importance (Figure 6). Firstly, scenarios are commonly developed from which a future vision and specified objectives are derived. Applied to climate change mitigation, the vision could be to prevent a further increase in global temperature. Consequently, the climate related objective would be, to stick to the 1.5 degrees goal when planning the transport program. A SUMP, however, would include as well other goals, such as accessibility, transport safety, environment, and others.

Figure 6: From objectives to measurable targets



Source: Rupprecht Consult 2019, SUMP Guideline

Based on these objectives, the SUMP process derives indicators which allow for SMART targets. In case of our climate objective a SMART target would be to reduce local transport emissions in 2030 by 55% compared to 1990.

Figure 7: SMART Targets

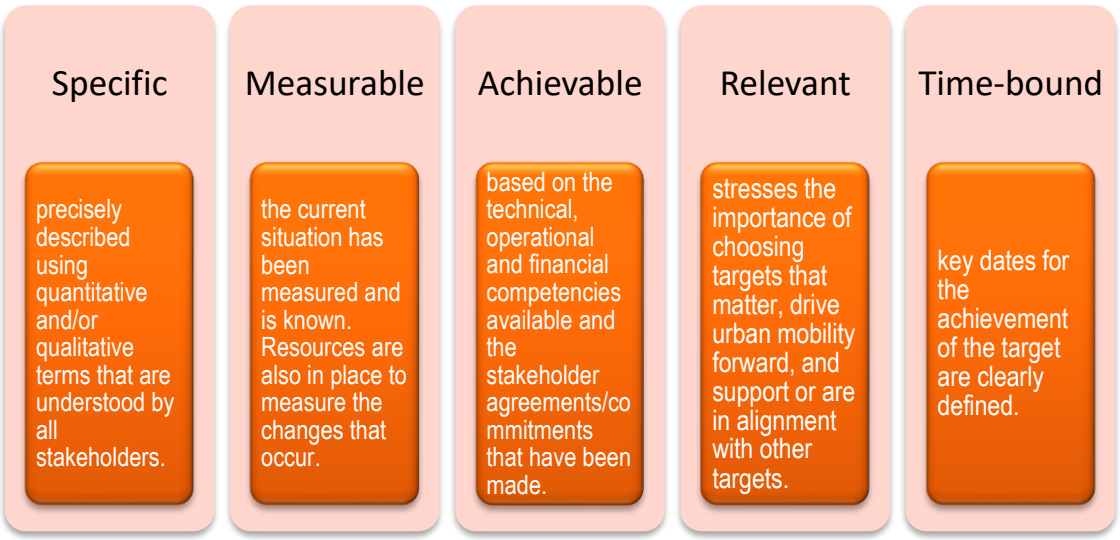


Figure INFRAS. Rupprecht Consult 2019, SUMP Guideline.

Based on these targets the transport interventions (measures) are planned. The planning process for multi-target SUMPs is quite complex, since the impacts of the measures on a larger a larger set of targets have to be quantified. This process involves major calculations, often using complex transport models, as well as cost-benefit or multi-criteria analysis. In case of our single climate target, only a prioritisation procedure using a cost effectiveness approach might be sufficient, as described later on page 35.

According to the guidelines, the selected measures are lumped into packages before they are implemented. The calculation of costs and safeguarding financial sources is another step. An important, but in practice often neglected issue, is the monitoring of implementation and the impacts described in the guidelines.

Since the whole process is quite comprehensive, it requires a considerable timeframe which may take several years and will even be prolonged if feasibility studies for major investments need to succeed. This may be justified by developing a sound planning framework. Climate targets, however, have been neglected in transport for so long, that immediate action seems to be urgent.

4.3. Overview on SUMPs and climate mitigation

4.3.1. Broad screening of SUMPs in the EU

In the first step of the analysis of SUMPs, a large number of SUMPs has been screened with the focus on the coverage of (quantitative) climate objectives for urban transport. This comprehensive screening was based on the ELTIS database of SUMPs, focusing on a selection of cities with SUMP involvement that covers different city sizes and represents all 27-EU countries plus Switzerland and the United Kingdom as evenly as possible. In addition, the previous finalists of the European Commission's SUMP award were taken into account for the selection process. The screening covered 168 SUMPs, including 162 SUMPs for cities from EU-27 countries (all countries covered with at least one city), plus selected SUMPs from Switzerland (3) and UK (3).

The screening has been done according to the scheme in Figure 1 (see chapter 2.2). The main question (and selection criteria) of the comprehensive screening was, if the SUMP includes quantitative objectives for climate change mitigation in mobility. If the plan does include any quantitative target, it was assessed as potentially interesting for further study – i.e. is included in the longlist.

The screening with the focus on quantitative objectives for climate change mitigation included the following questions (see also full set of screening criteria in Annex A1):

- Are specific climate change mitigation objectives/targets mentioned?
- How are targets set for mobility? (qualitative objectives, quantitative targets, other)
- What is the reference of the targets? (none, NECP[9], EU targets, regional targets, scenario or model calculations, etc.)
- Are the targets clearly quantified, i.e.in % or ton reduction, target year, reference year?
- What are the concrete CO_2 reduction target for 2030, 2050 or any other year (compared to 1990 or another reference year)?

From all 168 SUMPs screened, a total number of 48 SUMPs includes quantitative climate mitigation targets for mobility. This means that **29% of all SUMPs** screened cover *quantitative* objectives and are being included in the longlist for further analysis. This list of suitable SUMPs includes SUMPs from all European regions and all city sizes. Still, there are some differences by region, city size and as well as year of approval of the SUMP. Therefore, the screening results have been analysed by those criteria (city size, country/region, year of approval). The results are shown below.

[9] National Energy and Climate Plan

Analysis by city size

The SUMP screening includes cities of all sizes, even a significant number of cities with less than 100’000 inhabitants. The vast majority of cities is between 100’000 and 1 million inhabitants (77%). The analysis shows clearly that larger cities do more often cover quantitative climate objectives than smaller cities (see bright blue bar charts in Figure 8). For cities above 500’000 inhabitants, more than half of the SUMPs cover quantitative targets (cities above 1 million: 64%, cities with 500’000 – 1 million inhabitants: 55%). In middle sized cities, the share of SUMPs with quantitative climate objectives is around total average (32%). However, smaller cities below 250’000 rarely cover quantitative climate targets for mobility (only 12% on average for the least two classes of city size).

Figure 8: Number of SUMPs by city size

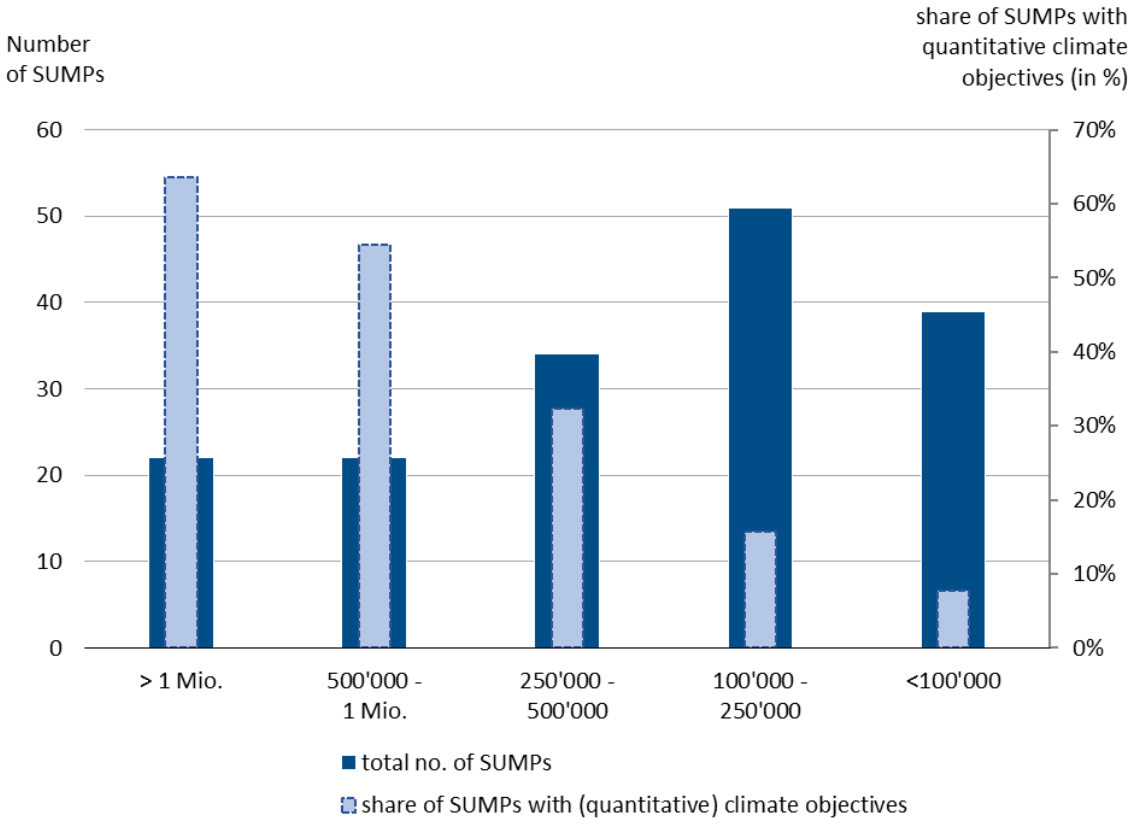


Figure INFRAS. Source: Own analysis based on Eltis database.

Analysis by region

All EU-27 countries are covered in the analysis. In 17 of those countries, there are cities with a SUMP including quantitative climate objectives. However, there are some differences between the European regions. For Western Europe, the total number of SUMPs analysed is highest (above 60) and the share of SUMPs with climate targets is above average (40%), too. In Mediterranean countries as well as in Scandinavian and Baltic countries, the share of SUMPs with quantitative objectives is around the overall average. However, in Eastern Europe, this share is only 9% and therefore significantly lower than in the other regions.

Figure 9: Number of SUMPs by region

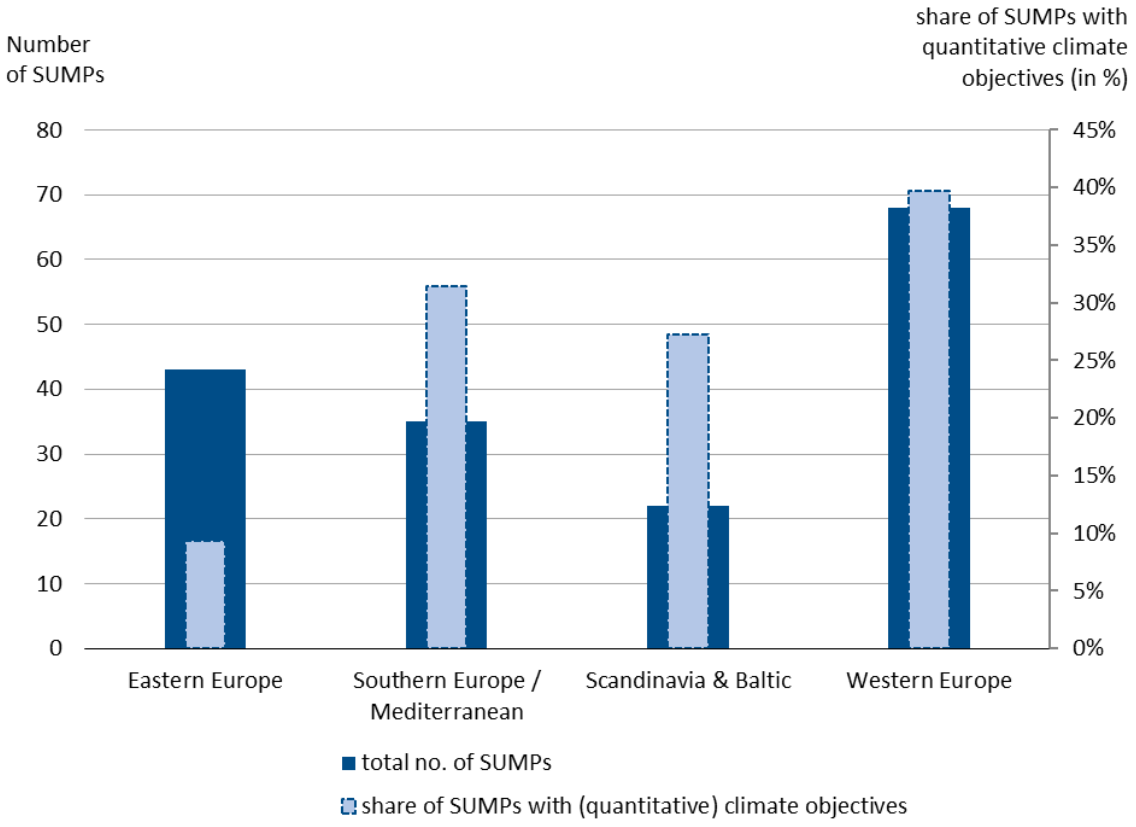


Figure INFRAS. Source: Own analysis based on Eltis database.

Annex A3 shows the total list of SUMPs screened by country.

Analysis by year of approval

Another interesting aspect is the year of approval of the SUMPs. The analysis includes SUMPs from between 2003 and 2021. Most of the SUMPs screened have been established between 2013

and 2021. 2013 was the year when the SUMP guidelines have been introduced. After that, the total number of SUMPs increased significantly. However, the share of SUMPs with quantitative climate targets did not increase yet. The older SUMPs from between 2003 and 2009 only rarely include quantitative climate objective for mobility (only one of nine). From the SUMPs established between 2010 and 2018, between 23% and 27% set quantitative climate targets. Since around 2018/2019, climate issues have become more important in urban mobility plans – notably a result of the increasing relevance of the climate mitigation issue in public and political discussion. This development is clearly reflected by a significant increase in the share of SUMPs with quantitative climate objectives: almost 50% of the SUMPs that have been established between 2019 and today include quantitative targets.

Figure 10: Number of SUMPs by year of approval

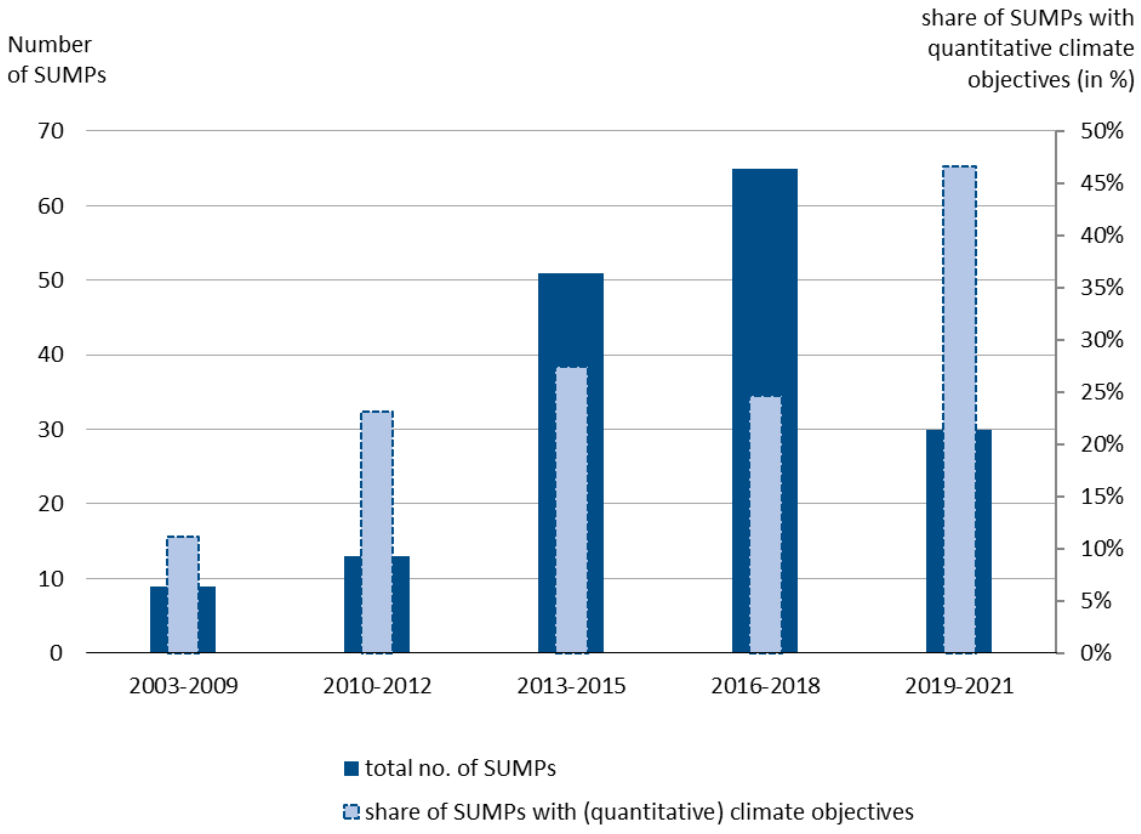


Figure INFRAS. Source: Own analysis based on Eltis database.

Analysis of climate objectives

From the total number of 48 SUMPs with quantitative climate objectives for the mobility sector, the vast majority includes reduction targets in % of the greenhouse gas emissions compared to a reference year. The target year is for the reduction goals is generally between 2020 (for older SUMPs) and 2030. Few SUMPs also include medium-term objectives for 2035 and 2040. Around 20% of those 48 SUMPs also include long-term objectives for 2050.

In absolute terms, the reduction targets are as follows:

- For 2050, the reduction targets vary between -75% and -100% (climate neutral – of fossil-free). A few SUMPs already aim to be climate neutral in mobility until 2040 (e.g. Den Haag, Tilburg, Greater Manchester).
- For 2030, the reduction targets in mobility vary between -25% and -40% compared to the level of 2005/2010. A few cities are aiming at more ambitious objectives, e.g. Barcelona (-49% until 2030 compared to 1990), Leipzig (-57% until 2025 compared to 2008) or Greater Manchester (-48% until 2020 compared to 1990).
- Only for a minority of the SUMPs the reference of the quantitative targets is described and clear. Some of the objectives refer to national climate mitigation targets and some to cross-sectoral targets for the city (e.g. Madrid, Stockholm).

4.3.2. In-depth analysis of SUMPs

From the 48 SUMPs that include quantitative climate objectives, an in-depth analysis was conducted for a first sample of 12 SUMPs. The 12 examples have been selected by several criteria: SUMP awarded, SUMP/city recommended by experts (from JASPERS, EU representatives), geographical diversity, diversity of city size. In a next step, the in-depth analysis could possibly be expanded further – depending on whether the emphasis will be more on a broader in-depth analysis on that level, or on the detailed analysis of the case studies (next working step).

The following section shows first conclusions of the in-depth analysis of the 12 SUMPs[10]. It is important to state that the following conclusions do not cover a representative sample of SUMPs, but a selection of SUMPs with quantitative climate objectives (and partially awarded SUMPs). Therefore, the SUMPs analysed can be declared as (at least partially) best practice examples.

[10] Vienna (AT), Gent (BE), Tallinn (EE), Helsinki (FI), Paris (FR), Berlin (DE), Karlsruhe (DE), Kaunas (LT), Granada (ES), Stockholm (SE), London (UK), Zurich (CH).

Results and conclusion of the in-depth analysis of SUMPs:

- *Leading institution:* In most cases, the SUMP has been approved by the city government (mayor etc.). However, the plans/programmes/strategies have generally been developed by the urban transport department.
- *Planning area:* In most cases (8 of 12 SUMPs), the SUMP focuses on the city area itself. Only in 4 cases, the whole agglomeration is included.
- *Status quo analysis:* almost all SUMPs include a status quo analysis of the transport infrastructure and important transport demand figures. Most SUMPs also include a quantitative assessment of the status quo greenhouse gas emissions (or at least CO_2 emissions) of transport.
- *Climate objectives:*
  - *Mobility types:* The climate targets mentioned in the SUMPs generally include all land-based transport modes, i.e. private motorised road transport, public transport (road and rail), non-motorised transport (bike, pedestrian). Air transport is not included in the SUMPs analysed.
  - *Qualitative and quantitative targets:* The SUMPs analysed in more detail in this section all include quantitative targets (since this was a selection criterion, see above). All SUMPs analysed also include qualitative objectives for transport, e.g. on environmental issues, safety, accessibility, reliability, attractiveness, modal shift.
  - *Derivation of climate targets:* In the SUMPs analysed, the targets are not directly derived from national or regional targets (or EU targets). In some cities, the targets are derived from the cross-sectoral greenhouse gas mitigation targets of the city. In most cases, the climate objectives are derived from scenario calculations: the future greenhouse gas emissions have been quantified for a reference scenario and for (sometimes several) climate mitigation scenarios – based on traffic and emission model calculations. The objectives are generally based on the comprehensive climate mitigation scenarios. There is no SUMP available where the overall transport target is based on the expected impacts by measure (sum of all measures).
- *Embedding in overarching climate strategies:* Most SUMPs are not integrated in an overarching climate strategy – or at least it is not visible. However, it needs to be mentioned that only two SUMPs have been established after 2018 (Berlin: 2021, Tallinn: 2019). In Berlin, the SUMP and its climate objective is aligned with the city's climate and energy programme 2030, developed in 2019 ("Berliner Energie- und Klimaschutzprogramm 2030").
- *Monitoring (target achievement, implementation of measures):* In less than half of the SUMPs analysed the expected impact on greenhouse gas (or CO_2) emissions is estimated ex-ante. In around half of the SUMPs it is stated that a monitoring including ex-post assessment of the impact is foreseen (however, the monitoring sometimes only includes the implementation of

measures and not the target achievement). It is not clear whether the rest of the cities does not plan any monitoring or whether it is just not stated in the SUMP. – The monitoring (mainly the target achievement) might be an important issue to look in more detail in the case studies. Examples: Some cities regularly evaluate the prioritisation of their measures and projects – for example Helsinki and Zurich.

- *Measures (type of measures, transport areas covered):*
  - *Public transport:* In almost all SUMPs, measures to promote public transport are first priority. In most cities the expansion of the public transport infrastructure is an important pillar – new tram networks, additional tram links, additional underground infrastructure or trolleybus infrastructure. Besides infrastructure measures, also an increase of frequency in existing public transport services is aimed at in several cities. Additionally, some cities also include measure to prioritise the public transport on the road (e.g. separate lines, prioritisation at traffic lights) to accelerate and increase reliability.
    Examples: Gent planned to replace the most frequent bus lines by tram lines. Tallinn also plans several new tram lines, as well as London (mainly in the south).
    No issue in the SUMPs analysed are new cable car infrastructure.
  - *Non-motorised transport (pedestrian and bike transport):* Bicycle traffic is a major focus in all SUMPs – new bike routes, bike highways or – very often – complete bike networks. In almost all cities pedestrian transport also is an important part of the mobility plans. A major issue is making pedestrian infrastructure more attractive and the increase of safety in pedestrian and bicycle transport.
  - *Road transport:* The expansion of the road transport network is an issue only in very few of the analysed SUMPs. The main emphasis in almost all cities is on road safety (e.g. lower speed limits) and the more efficient usage of the transport network. In some SUMPs, the measures include the downgrading of existing road infrastructure (for bicycle, pedestrians). Car-free city centres are an issue only in few SUMPs (e.g. Gent).
    Almost all SUMPs include measures in parking management, in order to make car transport less attractive and increase modal shift to public and non-motorised transport.
- *Costs, financial plan:* Around half of the SUMPs include financial information or plans for the foreseen measures. However, on that level of analysis it is not possible to say how detailed the ex-post analysis of the costs is analysed by the cities.
  Paris is an example of a SUMP with a very detailed cost plan for all the measures.

In the next step of analysis – the case studies (see chapter 5) – the interaction of the SUMPs with the urban climate strategies is investigated in more detail. The case studies also include the possible alignment of the urban climate strategies with SUMPs (e.g. objectives, measures).

4.3.3. Potential good practice examples

Based on the screening and the in-depth analysis of SUMPs (in chapter 4.3.1 and 4.3.2), a set of possible best practice of good practice examples of cities has been identified. The following short-list has been a first basis for the selection of the case studies (see chapter 5.1). There, the list has been further extended and aligned with the suggestions of the analysis of urban climate strategies (see section 3.3).

Short-list of possible good practice examples of SUMPs:

- Vienna
- Stockholm
- Tallinn
- Kaunas
- Brussels
- Dresden
- Granada
- Barcelona
- Paris
- Karlsruhe
- Greater Manchester
- Ghent
- Grenoble
- Helsinki
- Budapest
- Berlin
- London
- Toulouse
- Utrecht
- Bilbao
- Vitoria-Gasteiz
- Aachen
- Milano

4.4. Proposed methodology to include climate mitigation in SUMPs

4.4.1. Evaluation of EU support for urban transport projects

A special report by the European Court of Auditors (2020) criticises that "there is no clear indication that cities are fundamentally changing their approaches. In particular, there is no clear trend towards more sustainable modes of transport. Although cities have put in place a range of initiatives to expand the quality and quantity of public transport, there has been no significant reduction in private car usage … In the absence of legislative compulsion, there was limited take-up of the Commission's guidance on the part of many Member States and cities – notably in terms of preparing Sustainable Urban Mobility Plans". The Court criticised that "urban mobility policies at local levels were not always coherent with the aim of more sustainable urban mobility" (ibd p.5). Some projects were not as effective as intended:

- projects were not always based on sound urban mobility strategies;
- lack of quantified targets and operational plans to implement the strategies;
- lack of comprehensive and relevant data;
- insufficient coordination with other plans and of consideration for the urban periphery;
- deficits in financing the demands of sustainable urban mobility; and
- developing coherent policies in the areas of parking, traffic-free zones and cycling.

The above criticism was confirmed by the Evaluation of the 2013 Urban Mobility Package (2021). The Urban Mobility Package aimed to facilitate the achievement of the objectives set out in the 2011 White Paper, specifically in creating sustainable transport systems and cutting GHG emissions by at least 60% by 2050 with respect to 1990 levels. The evaluation states, that "the current trends in urban transport do not indicate a significant improvement in terms of modal share, traffic volume and greenhouse gas emissions".

Nevertheless, the report finds that the support of SUMPs has made "an important contribution to the evolution of mobility planning at the city level". However, the development of a SUMP does not necessarily guarantee that it will be implemented or that it is of sufficient quality. Additional attention is needed to ensure that SUMPs are effective tools towards achieving sustainable urban mobility and more decarbonisation objectives. The report criticised especially that EU funding is not linked to SUMPs.

4.4.2. Empirical evidence on the deficits of local transport policy making

The EU evaluations on a meta level can be confirmed through a bottom up approach based on practical observations[11] in the South West of Germany. Communal transport planning may be characterised as following:

- Local traffic goals are mainly focussing on removing bottlenecks in the road system, sometimes even expanding it.
- On the other hand, transport related climate targets are insufficiently specified and mostly not quantified at all.
- Planned measures are often not examined for their climatic impact.
- There is a lack of long-term and strategic investment planning to meet the climate targets.

Municipal transport planning is often determined by changing political majorities and is therefore subject to the risk of being driven by short-term political targets, rather than being oriented towards long-term goals, such as climate mitigation. As a result, often emotional discussions about individual measures dominate local council debates.

A political consensus is often achieved by the expansion of road and/or public transport (PT) capacities; and sometimes as well by cycle networks. It is frequently overlooked that the improvements in public transport do not automatically lead to a reduction in car traffic; and due to the improved supply of PT services, CO_2 emissions might even increase as a consequence. Measures that make car traffic unattractive, on the other hand, are much more difficult to implement by politicians, as they usually meet with public resistance.

The present planning approach may be grossly described as follows: Firstly, scenarios or measures are planned in order to alleviate existing problems, and in a second step the impacts of the measures are assessed. As mentioned above, the effects on CO_2 emissions are mostly not quantified. In case this is done, a third step is often missing, which adjusts the measures in order to achieve the climate goals.

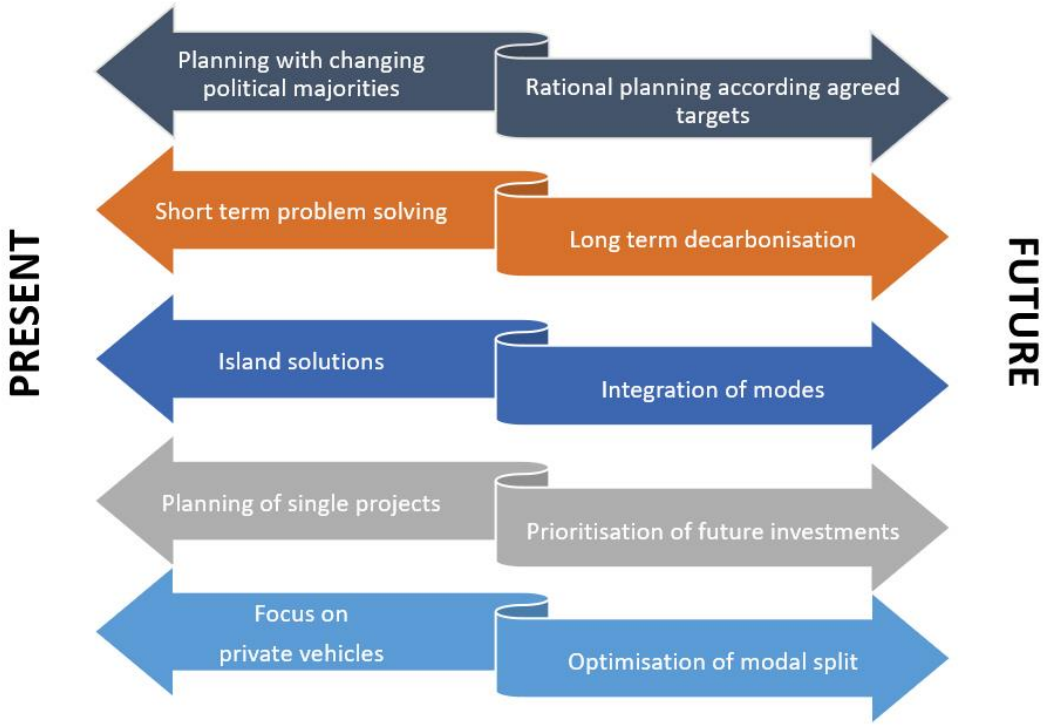
4.4.3. A new planning philosophy

The political and administrative conditions in the municipalities imply that local transport planning is often not very systematic and geared towards solving short-term problems. Political cycles usually comprise four to five years, strategic long-term plans 10 to 20 years, while the Paris agreement focusses on 2050. In their totality, the planned measures are usually not suitable for

[11] https://www.isi.fraunhofer.de/de/blog/2021/klimamobilitaetsplaene.html

bringing about substantial reductions in traffic-related GHG emissions. In order to meet the challenges of climate change, a rethinking in municipal planning is needed.

Figure 11: Change of approach in municipal transport planning (change in processes of municipalities)



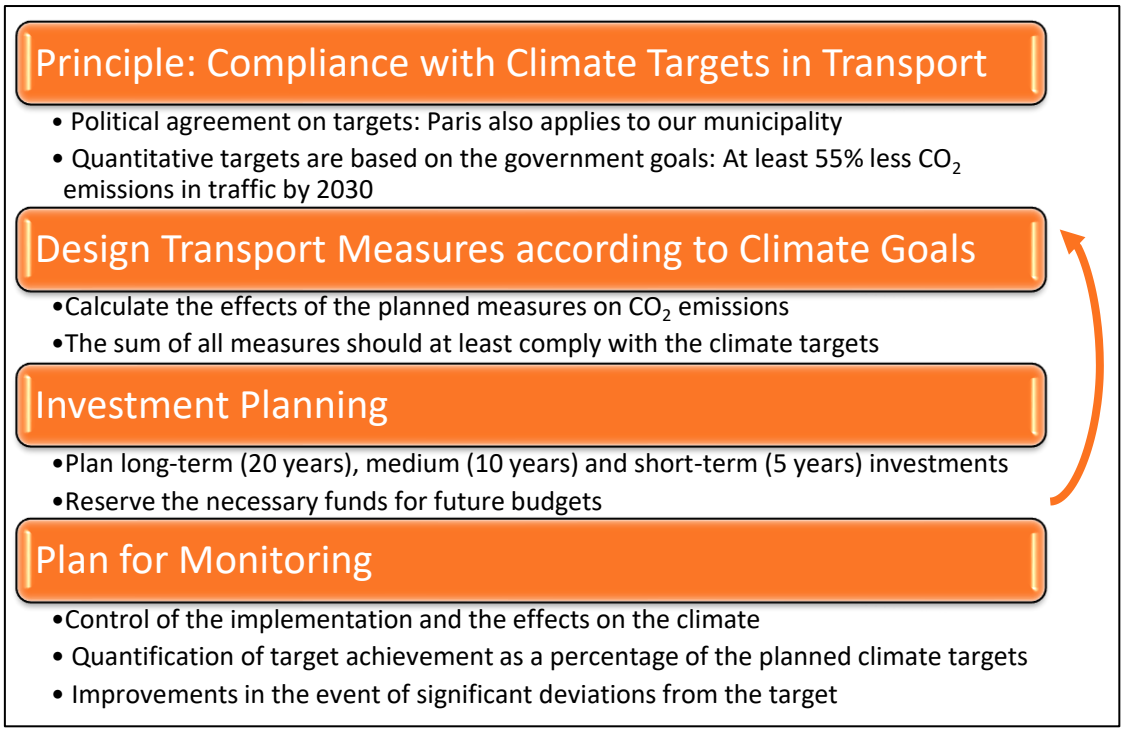
Sustainable Urban Mobility Plans can induce this new planning philosophy, if they were strictly focussing on climate change mitigation. The EU may support this transition process, by funding support to the development of SUMPs with strong climate goals.

Focussing on climate mitigation does *not* mean that the existing SUMP methodology should be entirely altered. On the contrary, SUMPs tackle a large number of important issues, such as accessibility, pollution reduction, traffic safety and urban liveability that are indispensable for sustainability. However, the achievement of climate targets is a “conditio sine qua non” for the approval of the plan. Which means, if total future CO_2 emissions do not decline according to a pathway defined by the Paris goals, the whole plan is not considered as sustainable, even though it might include many positive aspects. The following sections describe methodologies on how to achieve this pathway.

4.4.4. A methodology to include climate targets in SUMPs

The most important basic idea of this new planning approach is a **GHG reduction pathway** in the transport sector. This implies to cap for future CO_2 emissions from traffic, by planning for an allowable annual CO_2 budget that will be reduced over time and finally lead to decarbonisation of the transport sector in 2050. The methodology would reverse the present planning process into a backcasting procedure. The starting point are not present transport problems, but the climate target set by the municipal councils. The salient question to be answered in the new approach is: which measures need to be planned in order to achieve the climate targets? From our point of view, the following principles are essential:

Figure 12: Salient principles of a Climate Mitigation SUMP



The first step: Agreement on the climate targets

This is an acknowledgment that the Paris goals on the communal level from which quantitative targets for the transport sector are agreed upon. This could be either the 55% goals of the European Commission or a target related to the NECP.

Second step: Development of measures

The planned transport interventions should focus on the achievement of the goals set in step 1. A qualitative assessment of the planning effects is mostly not sufficient to assess the impacts on climate mitigation. For example, the effects of pedestrian and bicycle traffic are often over-estimated: Although in Germany these modes make up one third of all journeys, the proportion of the relevant traffic volume, measured in passenger-kilometres, is only 6% (Wuppertal Institute 2020, p. 75). Intuitive impact assessments might be distorted as well by rebound effects, such as the shift from walking and cycling to public transport. In order to avoid such misjudgements, the overall effects of the plans on transport's CO_2 emissions must be calculated. This might be done by simple Excel spreadsheets for smaller towns, but for larger cities or regions the calculation has to be based on multimodal traffic to take account of complexities in larger cities and beyond. The approximate threshold may be 100 000 inhabitants and beyond, the larger the more important it is to base calculations on a four-step transport-model.

Third step: Investment planning

The planned transport measures need to be included in long-, medium- and short-term investment plans. The costs do not only include implementation costs, but as well planning and feasibility studies. For the investments adequate financial plans should be developed that include budgeting of future households, credit uptake and donor financing. Good planning needs to adequately analyse financial sustainability of the system and should also be integrated by an adequate financial programming for implementation of measures and projects in order to ensure they can be implemented, adequately maintained and operated. The complex procedures of funding and financing of SUMP measures as well as sustainable public procurement in SUMPs is discussed in detail in Werlan and Rudolph (2019), Werlan et al (2019) and Rupprecht Consult (2019).

Forth step: Ex-post monitoring

Monitoring is not regularly included in SUMPs, but may be important, especially if climate targets are not met. The monitoring process checks at previously defined intervals whether the planned measures have been implemented and whether the climate targets are being met. If the monitoring reveals that the climate targets have not been met, a refinement of the previous plans is necessary in order to achieve the targets. This implies a switchback to Step 2.

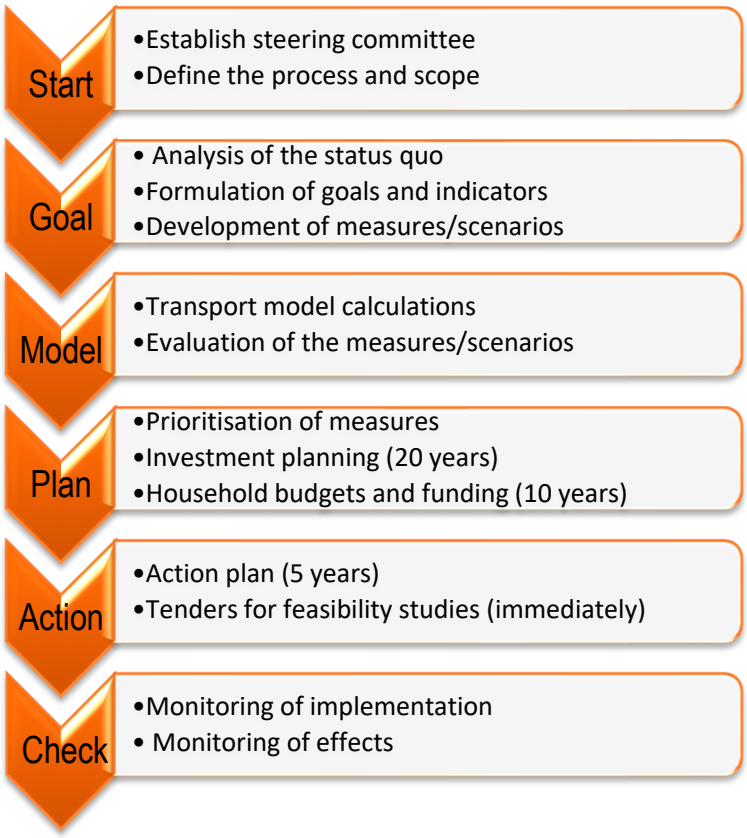
4.4.5. Municipal planning procedure

The frequently observed short-term nature of municipal planning can be eliminated through long-term political consensus. This has three main components:

1. Decision of the municipal council that the Paris climate targets also apply to traffic in the municipality.
2. The Council quantifies the objectives for the mobility plan with a time frame and measurable intermediate steps in line with the Paris objectives.
3. The entire planning process is accompanied by a steering committee in which all groups represented in the municipal council are represented.

A typical planning and implementation process could be structured similar to a SUMP process, as depicted in Figure 13.

Figure 13: Process for planning and implementation (adapted from SUMP)



4.5. Planning principles for climate change mitigation

On this issue a large amount of literature has been published which shall not be repeated here. However, given the constraints of communal planning, a number of issues shall be highlighted here.

Include PUSH and PULL measures

PULL effects make environmentally friendly modes of transport more attractive, i.e. the improvement of public transport, cycling and walking. PUSH effects are measures that make individual car traffic less attractive, such a parking management, road pricing or city tolls. The tendency of politicians to favour pull measures has already been explained above. However, empirical evidence shows, that only the combination of push and pull leads to sustainability. In practice this implies that an improvement of public transport, should go hand in hand with a constraint of motorised individual transport.

Source: Müller, P., Schleicher-Jester, F., und TOPP, H. (1992): Konzepte flächenhafter Verkehrsberuhigung. In: Flächenhafte Verkehrsberuhigung – Folgerungen für die Praxis. Herausgeber: Bundesministerien für Verkehr, für Umwelt und Reaktorsicherheit, für Raumordnung, Bauwesen und Städtebau, Bonn.

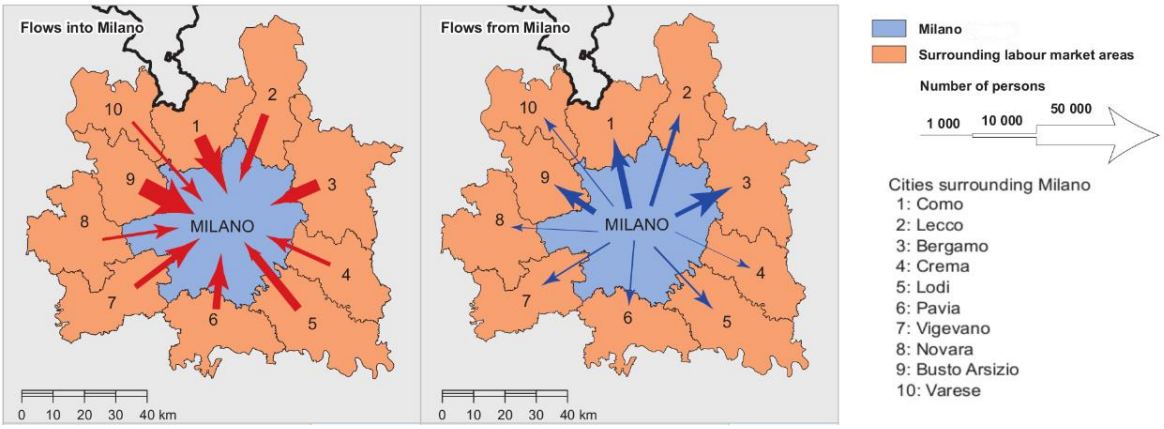
In the past, parking management has proven to be the most efficient push measure: In Vienna, for example, it contributed to a massive increase in public transport[12]. An annual reduction in the number of parking spaces in downtown Copenhagen by 3% contributed to a massive increase in bicycle traffic[13]. The re-use of road lanes for environmentally friendly modes is an efficient push measure, especially if high capacity systems such as Bus Rapid Transit are established instead. Finally, the pricing of road usage has proven to be effective in reducing car traffic in city centres of London (Transport for London 2008), Singapore and many Scandinavian cities (www.eltis.org, 05/11/2009).

[12] The share of trips by car decreased form 40% in 1993 to 27% in 2015 (Source: Wiener Linien)
[13] For more information on parking management, please consult Agora Verkehrswende (2018)

Delimitation of the planning region

Since the traffic does not simply stop at the municipal borders, the planning must include the city as well as the surrounding suburban area. As an example, Figure 14 shows the commuter flows in and out of Milano. 2/3 of Potential Good Practice SUMPs screened in this project, only plan within administrative boundaries of their city. Given the large volumes of in- and outflowing traffic, it is imperative to develop a SUMP including the surrounding peri-urban municipalities. However, this entails a close cooperation between the municipalities involved which makes the planning process not easier, especially if conflicting interests occur.

Figure 14: Commuter flows to and from Milano 2011

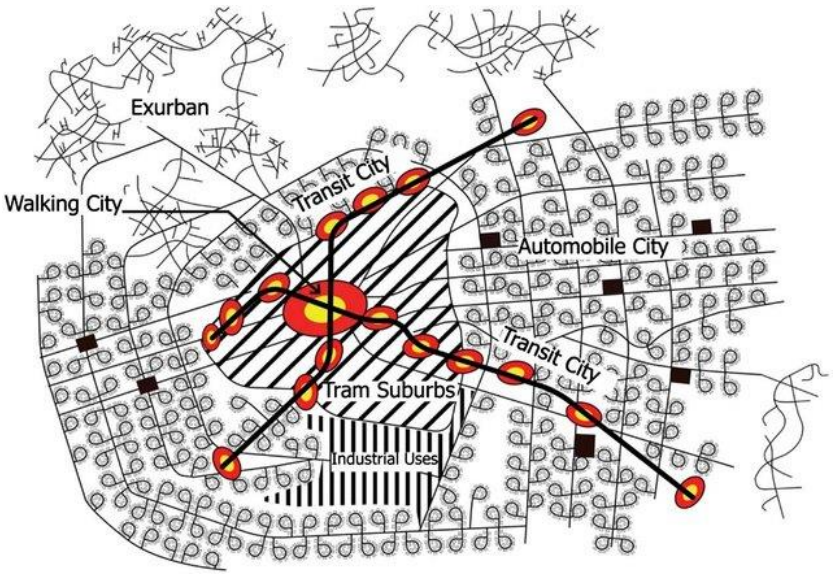


Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:Urban_Europe_%E2%80%94_statistics_on_cities,_towns_and_suburbs_%E2%80%94_working_in_cities&oldid=294970

Transport and land-use interactions

One of the major causes of the growing transport volumes is the so-called urban sprawl which occurs automatically with increasing car ownership. Uncontrolled sprawl does not only augment travel volumes, but creates as well automobile cities that are difficult to serve by public transport. The nexus between urban density and energy consumption in transport has been well described (Newman/Kenworthy 2021). The main drivers for this development are high real estate prices in the city centres and the desire to own a house with garden in the nature.

Figure 15: The Theory of Urban Fabrics with a variety of fabrics created by different transport modes



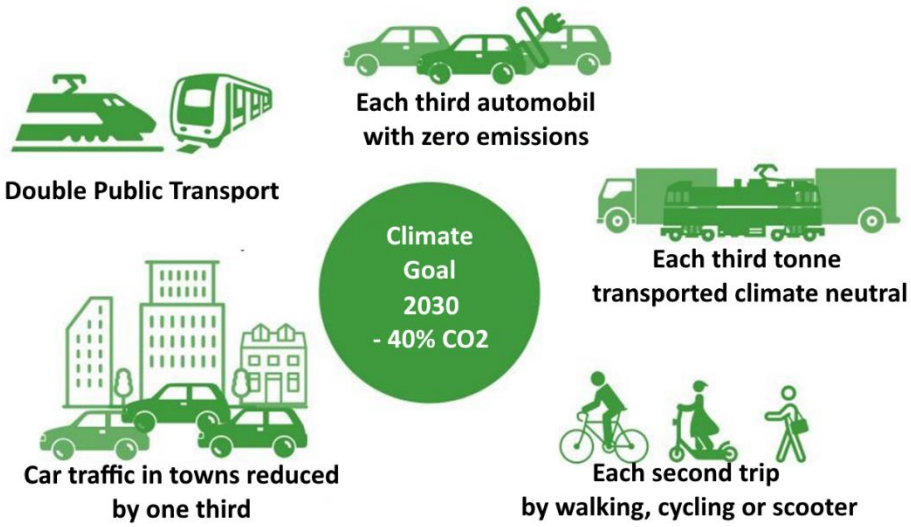
Source: Newman et al 2021

The solution to this phenomenon, ubiquitous in all automobile societies, is an integration of transport and land-use planning including the implementation of point axle systems in a Transit Oriented Development (TOD). Regional land-use planning prevents a further sprawl of settlements while transport planers design appropriate public transport system in the axles and non-motorised networks in the city and subcentres (Figure 15).

Modal integration and participatory planning

Modern transport planning is integrating all modes of transport in order to optimise traffic flows. The Transport Ministry of the State of Baden-Württemberg, Germany has calculated the requirement for the transport sector to reduce CO_2 emission by 40% in 2030 compared to 2010 as depicted in Figure 16. Tremendous efforts need to be undertaken to reach this goal, and the endeavour needs to increase even more, if the Commission's 55% goal should be achieved.

Figure 16: Measures necessary to achieve a 40% CO_2 reduction in transport by 2030 compared to 2010 in Baden-Württemberg, Germany



Source: Verkehrsministerium Baden-Württemberg 2021

The shift of individual car mobility towards electric vehicles will contribute substantially to mitigate climate impacts of transport. However, the effect should be cautiously analysed in the SUMP calculations, since future market shares will be limited, as the above example demonstrates. Furthermore, the actual impact of e-cars will strongly depend on the share of renewable energies to charge them.

The graph shows as well that only an intermodal approach is suitable to achieve the climate goals. Sustainable plans include not only Public Transport, but as well walking and cycling, which both receive more attention in the past years. With the planned increase in public transport, attractive access and egress to the stations becomes more and more important. Additionally, pedelecs (motorised bicycles) make distances above 10km more attractive for cycling and thus cycling will increase its share not only on the modal split, but as well on transport volumes (pkm).

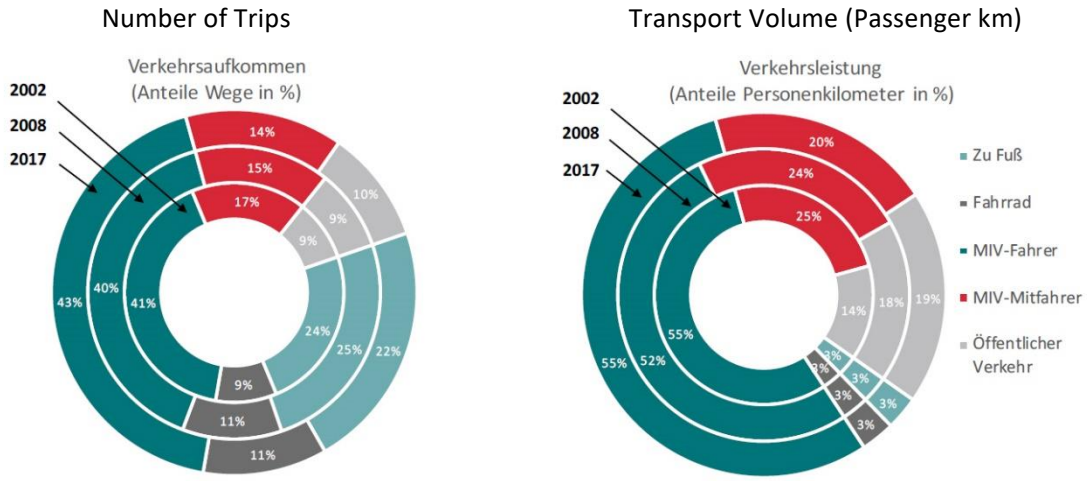
Of course, sustainable planning cannot take place without the early and participatory involvement of the public (Rupprecht Consult 2019, p.44f).

Non-motorised transport

Walking and cycling is not only considered as the most climate friendly means of transport, but as well very beneficial for public health. In the last years a boom of investments in walkways, bicycle lanes and cycle speedways may be observed. However, the impact on climate mitigation should not be overestimated, since walking and cycling trips are much shorter than trips by automobiles. For example, in Germany one third of all trips are conducted non-motorised, which

amounts to only 6% of transport volume, measured in Passenger km (Wuppertal Institute 2020). Fortunately, electric bicycles (pedelecs) increase the distance tremendously and thus prospects for cycle speedways improve with increasing usage of these vehicles.

Figure 17: Modal shares: large difference between the two views: share per number of trips vs. share per transport volume (pkm)



Source: Wuppertal Institute 2020

Prioritisation of measures

The example of Baden-Württemberg shows that a number of measures are needed to reach the climate goal. But which ones should be implemented first and which ones omitted? Usually this question is answered by a cost-benefit analysis. This methodology sums up all benefits, such as travel time improvement, vehicle operating costs and environmental impacts and counter-weights these with the investment costs. However, research of four international TEN-T projects shows, that travel time improvements and vehicle costs make up 77% of total benefits and environmental effects only account for -1% to 11% of all benefits (HEATCO D6, 2006, p.40). An assessment of the German Federal Transport Plan BVWP revealed that only 0.2% of all benefits can be attributed to climate change mitigation measures[14] (Doll 2020, p. 19).

With a strong climate goal in mind, **a cost effectiveness approach might be much more suitable**. This methodology could rank all possible measures according to their CO_2 avoidance costs which is measured in Euro/ton CO_2. For example, a general speed limit will be much cheaper (per tonne CO_2 reduction) than a bus system, which again is cheaper than a light railway or a metro system.

[14] CO_2 costs set at 70 Euro/ton

However, additional criteria should be taken into consideration as well. These could be traffic safety, pollution, urban impacts, lengthy planning procedure, and others. The final prioritisation should be left to the local decision makers.

Duration of planning procedures

Time flies; since the 55% goal is targeting already at 2030 only 9 years remain. This contrasts with the duration of planning procedures which usually comprise several years. For example, in Germany the average planning period for railways from the start of planning to the start of construction is currently around eleven years[15]. A whole SUMP process may take about one to two years to complete. The speeding up of planning procedures in not uncritical, since many components such as participation and environmental assessment are compulsory for sustainability.

A possible solution might be the usage of existing infrastructures for public transport. The conversion of roads into reserved bus lanes for Bus Rapid Transit Systems have several advantages, such as fast planning procedures, low infrastructure cost with high carrying capacities, and a combination of PUSH and PULL (UITP 2019).

Strengthen the planning capacities of municipalities

Municipalities cannot be blamed for the above described deficits in SUMP development. They are often overburdened with their traffic planning demands, especially when overarching goals, such as climate protection, are to be included. The acquisition of the data bases and the calculations of specific scenarios are associated with considerable expenditure of money, time and personnel.

Sufficient and qualified specialists are necessary for the creation and implementation of SUMPs. Often human capacities in the planning departments are inadequate, planning processes are lengthy, and the financial resources for planning are limited (Werlan et al 2019, p 12). Especially, small and medium-sized municipalities need more staff and further training to fulfil the upcoming tasks.

[15] Deutscher Bundestag Drucksache 19/18052 from the 17.03.2020

5. Case studies

This chapter first provides a brief description of how the 13 cities were selected for the case studies. After that, a summary with the main findings is given for each city or metropolitan region. Finally, the chapter summarises the findings of the case studies and gives an overview of the success factors and shortcomings of the strategies.

5.1. Selection of case studies

Based on the results of the analysis of the climate mitigation strategies (ch. 3.3) and the SUMPs (ch. 4.3) a set of at least 12 case studies for further and more detailed analysis had to be chosen. Based on the previous analyses, a longlist of possible cities for case studies was compiled (see following table).

Table 2: Longlist of possible cities for case studies

City	SUMP			SECAP/SEAP	
	available	quantitative climate targets	SUMP award	available	climate targets for mobility
Aachen (DE)	(X)	Partly		(X)	?
Barcelona (ES)	X	Yes		X	?
Bilbao (ES)	X	Yes		X	?
Bologna (IT)	X	No		X	Yes
Brasov (RO)	X	No		X	-
Brussels (BE)	X	Yes	X	X	?
Dresden (DE)	X	Yes		X	Yes
Ghent (BE)	X	Yes	X	X	?
Granada (ES)	X	Yes	X	X	-
Greater Manchester (UK)	X	Yes	X	X	Yes
Grenoble (FR)	X	Yes	X	X	Yes
Karlsruhe (DE)	X	Yes (partly)		X	Yes
Kaunas (LT)	X	Yes	X	X	-
Milano (IT)	X	No (not yet)	X	X	new plan in development
Parma (IT)	X	No		X	Yes
Tallinn (EE)	X	Yes		X	?
Toulouse (FR)	X	Yes	X	X	Yes
Stockholm (SE)	X	Yes	X	X	Yes

City	SUMP			SECAP/SEAP	
	available	quantitative climate targets	SUMP award	available	climate targets for mobility
Stuttgart (DE)	X	No		X	Yes
Vienna (AT)	X	Yes	X	X	Yes
Vilnius	X	Yes		-	
Wroclaw (PL)	X	No		X	-
Zurich (CH)	X	Yes		X	Yes

Table INFRAS.

Based on this longlist and based on consultation with EIB/JASPERS the set of case studies has been selected. The main selection criteria were:

- availability of SUMP (and possibly SECAP)
- geographical diversity
- quantitative climate targets for mobility in the SUMPs
- possible good practice examples
- other criteria: availability of contact persons, actuality of plan

Final selection of case studies

The following table shows the 13 cities selected for in-depth case studies. Generally, the case studies focus on geographical level of the SUMP (mostly: core city). In some cases, also the geographical level above the core city was studied, e.g. by an additional interview.

Table 3: Final selection of case studies

No.	City / region	Strategy	Geographical level of the analysis
1	Bologna (IT)	SUMP & SECAP	city & metropolitan area
2	Brasov (RU)	SUMP	metropolitan area (and city)
3	Ghent (BE)	SUMP	city
4	Granada (ES)	SUMP	city (& region of Andalusia)
5	Greater Manchester (UK)	SUMP	metropolitan area (and city)
6	Grenoble (FR)	SUMP & SECAP	city
7	Karlsruhe (DE)	SUMP & SECAP	city & region (Baden-Württemberg)
8	Kaunas (LT)	SUMP	city & national level (Lithuania)
9	Stockholm (SE)	SUMP & SECAP	city
10	Toulouse (FR)	SUMP & SECAP	metropolitan area (and city)
11	Vienna (AT)	SUMP & SECAP	city
12	Vilnius (LT)	SUMP	city & national level (Lithuania)
13	Wroclaw (PL)	SUMP & SECAP	city & metropolitan area

Table INFRAS.

Methodological approach

For the case studies selected, in-depth information about the SUMP (and additionally the local climate mitigation strategy) were gathered. The case studies are based on:

a. selected interviews (by phone or e-mail) with the experts/persons in charge in the cities
b. in-depth analysis of the available strategy documents available (desk research)

It was the aim to conduct at least one interview per case study, in some cases two (see below). In all cities 1-2 interviews per city have been conducted. The majority of the interviews were done by video conference, a minority of the interview were carried out via written questionnaire (via e-mail).

The following table shows the list of contact persons interviewed per case study.

Table 4: List of contacts for case studies (good practice SUMPs)

City	Contact person (name, department/institution)
Bologna (IT)	Metropolitan area: Mr Alessandro Delpiano, Cittá metropolitana di Bologna (general coordinator of the SUMP)
	City: Mr Cleto Carlini, Head of the mobility department of the municipality

City	Contact person (name, department/institution)
Brasov (RO)	Metropolitan area: Catalin Frangulea, Brasov Metropolitan Association for Sustainable Development of Public Transport
Ghent (BE)	City: Mrs Johan de Mol, Prof. at University of Gent
Granada (ES)	City: Jorge Moreno Mochón, Subdirector General de Movilidad Granada Regional level (Andalucia): Mr Manuel Márquez Pigner, Junta de Andalucia
Greater Manchester (UK)	Metropolitan area: Mr Stuart Blackadder, Innovation Strategy Officer, Transport for Greater Manchester (TfGM)
Grenoble (FR)	Metropolitan Area: Mrs Tiphaine Bretin, Project Manager for Urban Mobility and Public Transport Development at Grenoble-Alpes Métropole
Karlsruhe (DE)	City: Brigitte Stummer, Stadtplanungsamt Karlsruhe – Bereich Verkehr Regional level (Baden-Württemberg): Simone Fedderke, Transport Ministry Baden-Württemberg, Climate Protection in Transport
Kaunas (LT)	City: Mrs Aistė Lukaševičiūtė, Kaunas City Municipal Administration National level: Mrs Gintare Janušaitienė, Future Mobility Policy group, Transport Ministry of Lithuania
Stockholm (SE)	City: Mrs Sara Bergendorff, transport planner at the City of Stockholm
Toulouse (FR)	Metropolitan Area: Mr Christophe Doucet, Director of Planning and Eco-Mobility at Tisséo Collectivités
Vienna (AT)	City: Mrs Angelika Winkler, Deputy Head of Department for Urban Planning & Transport Planning
Vilnius (LT)	City: Jonas Damidavičius, Head of Sustainable Mobility Vilnius National level: covered with the interview with Gintare Janušaitienė (see above: Kaunas), but J. Damidavičius also covered the national level since he formerly worked for the Lithuanian transport ministry
Wroclaw (PL)	City: Mrs Monika Kozłowska-Święconek, Director of Sustainable Mobility Office, responsible for SUMP Wroclaw Metropolitan area: Mrs Magdalena Wdowiak-Urbańczyk, Director of Integrated Territorial Investment Office, responsible for SUMP for Wroclaw Functional Area

Table INFRAS.

The main goal of the case studies was to identify success factors and good practice elements on the one hand, and possible deficits and critical aspects on the other hand. The results of the

case studies were collected in **fact sheets**. For the fact sheets, a uniform structure has been developed for all cities. The fact sheets cover the following issues:

- General information about the SUMP
- Climate targets for mobility (availability, concrete targets, source, alignment with other targets and strategies)
  - availability of targets
  - information on the quantitative level of the target
  - development of target (how have the targets been derived, scenarios, ...)
- alignment of the urban strategies with overarching goals, strategies and plans at regional or national level
- impact assessment / quantification of impacts in the SUMP
- planned transport interventions/measures
- ex-post monitoring (target achievement, quantitative impacts, implementation of measures)
- other information: cost of measures, budget, financing
- interaction and alignment of SUMP with local climate change strategy (if available)

The level of detail of the resulting fact sheets differs between the case studies, depending on whether there have been interviews or not and depending on the depth and width of the plans and strategies themselves.

5.2. Results per city

In the following, the main findings are summarised for each of the 13 case studies. The summaries include the main topics analysed for the SUMPs: quantitative climate targets for mobility, alignment of targets and strategy with overarching goals, interaction and alignment of SUMP with local climate mitigation strategies, ex-post monitoring, key measures of the strategies and first learnings.

For all 13 case studies the detailed results of the analysis are presented in fact sheets. The fact sheets are added in the Annex of this report.

5.2.1. Bologna

The sustainable urban mobility plan of Bologna was approved end of 2019.The SUMP covers the whole metropolitan area of Bologna and was developed jointly by the metropolitan area and the city of Bologna. There has been installed a special organisation and coordination office by both administrative levels. The organisation includes the technical level as well as the director/administrative level to develop the SUMP. Additionally, also a scientific and political board has been created in order to communicate the results and strategy elements from the experts to the politicians.

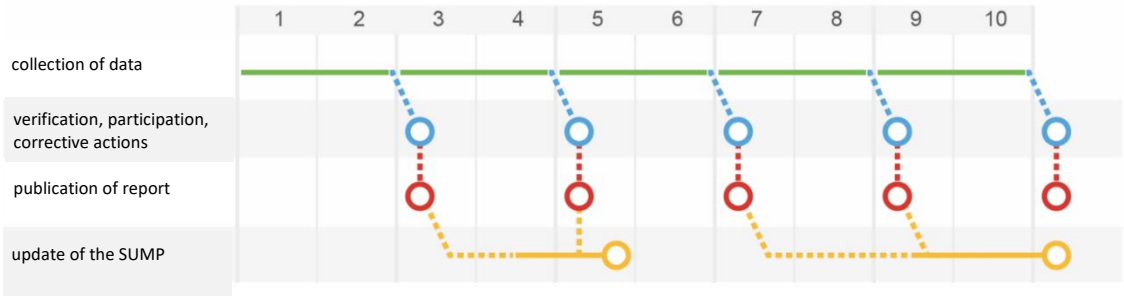
The SUMP of Bologna includes a climate mitigation target for mobility of -40% for greenhouse gas emissions by 2030 compared to 1990. The climate mitigation target has been aligned with the EU target valid at that time. The objective is consistent with the regional climate strategy of Emilia-Romagna. Additionally, the SUMP has also been aligned with the climate mitigation strategy (SECAP) of Bologna. The SECAP has been developed almost in parallel (slightly in advance) with the SUMP.

The climate mitigation target for mobility has been set based on that overarching EU target. Then, a transport scenario has then been developed that is able to meet the -40% target. The chosen SUMP scenario has been the most ambitious of several scenarios studied. According to the chosen SUMP scenario, the climate mitigation target is achieved a) by emission reduction through reduced private motorised traffic demand (-28%) and b) by the decarbonisation/electrification of the fleet (-12%). For the city area of Bologna (community), the mitigation and modal shift objectives are stronger than for the whole municipality area.

For the Bologna SUMP, a detailed monitoring has been developed. The monitoring consists of two parts: i) A continuous monitoring taking place every two years from the approval of the SUMP. ii) Additionally, every five years, a more in-depth ex-post monitoring is carried out. Based on that, the SUMP will be updated. The monitoring includes a large number of indicators that

allow a broad insight in the development of transport data and climate emissions. The monitoring system also includes processes in case of non-achievement of targets, meaning that after the five-year periods corrective actions are being taken if necessary (update of the SUMP).

Figure 18: Monitoring programme of Bologna SUMP (over ten years)



Source: SUMP Bologna (2019)

The three main pillars of the Bologna SUMP include a) a vast expansion of public transport with four new tram lines[16], denser commuter train services and new BRT lines, b) the promotion of non-motorised transport with the implementation of a strategic bike network and cycle stations, extension of pedestrian areas and bike sharing (as well as car sharing) and c) the restriction of motorised private transport (speed limits 30 km/h, low emission zones, extension of parking fees).

5.2.2. Brasov

Each of the seven regions of Romania, as well as Bucharest, benefited from a program launched by the national Ministry of Development and financed by the EBRD to develop SUMPs for all eight major metropolitan areas (one in each region and Bucharest). JASPERS assisted the Ministry in the pre-launch stage advising on the concept, including the Terms of Reference and the budget estimated for the contracts procured by EBRD. Four international consortia were contracted to prepare two SUMPs each. JASPERS prepared a number of resources to be used by other beneficiaries in the preparation of Mobility Plans, as well as to be used by the Ministry in the review and approval of such plans. They included: Romanian-specific Guide to the preparation of Urban Mobility Plans, elaborating the EU SUMP Guidance and integrating with the Legal Norms, Technical model and explanatory note for the calculation of GHG emissions at project or plan level, Approval checklist for the use of the Ministry when reviewing Urban Mobility Plans submitted by individual local authorities.

[16] The first tram line – the red line – is assumed to be launched before 2025, the green and yellow line by 2030 and the fourth line (blue line) also around 2030.

In Brasov, the consortium worked with the city and the mayors of the surrounding regions and insisted on creating a joint ownership for the SUMP. Since the Brasov Metropolitan Association for the Sustainable Development of Public Transport is an association of various public entities, the organisation was ideally suited to be-come the owner of the SUMP. A few months after the SUMP was handed over to the organisation, the Romanian Ministry of Development passed a law that changed the specifications for structuring the SUMP. As a result, the text had to be re-structured and the SUMP was finalised in 2017. The process of elaboration of the SUMP of Brasov was highly affected by time constraints. The late public procurement done by the Ministry of Development of Rumania for the eight SUMPs has affected the implementation timeline.

The SUMP does not contain a specific quantitative climate target for mobility. However, a scenario analysis was conducted with four scenarios. The calculations of the JASPERS assisted transport model were used as input variables.

The scenarios differ in the scope and number of measures. Scenario 0 merely involves maintaining the current situation (base year 2015). Scenario 3, on the other hand, is the ideal case with all desired improvements and investments (desired scenario). The projects and measures were evaluated using a multi-criteria analysis (MCA). This method is combined with a cost-benefit analysis (CBA) to assess economic efficiency. This approach allowed an individual assessment of options and measures, but also an assessment of the impacts of a set of options and measures. This process led to the preferred package of measures. The selected scenario for implementation is a mix of scenario 2 and scenario 3. It includes measures that scored well in the assessment and are economically viable (all projects from scenario 0, all projects from scenario 1, most projects from scenario 2 and some projects from scenario 3). The SUMP was prepared as a prerequisite for funding through the regional operational program. Thus, the selected scenario considers what can be financed from the regional operational program and is tailored to the financial plan (feasible goal). After four years of implementation, the scenario is more than 80% realised.

The environmental impact of the measures in terms of CO_2 emissions was only assessed for the selected scenario. Under the selected scenario, CO_2 emissions from the transport sector are expected to be reduced by 6% in 2030 compared to 2015. However, these estimates are considered rather conservative. The SUMP mentions that an ex-post monitoring is planned, but the approach is not yet fully developed. The strategy recommends indicators for monitoring and assessing the results of the implementation of the investments (e.g. number of electric buses, emissions, number of serious accidents). It is proposed that monitoring is carried out annually by the municipality.

In Brasov, school mobility is a major challenge, as many parents drive their children to school. Therefore, school transportation is an important component of mobility in Brasov. To

make it more efficient, a dedicated bus line was introduced for students and teachers only. However, this did not solve the problem; school transport still causes a lot of car traffic in Brasov.

The SUMP planned to replace 26 diesel buses with electric vehicles. However, thanks to additional projects (which were not actually foreseen in the SUMP), a total of 98 electric buses were finally purchased. Overall, public transportation network measures are considered as the first priority, bicycle network measures are considered the second priority. Third priority is considered for promoting opportunities for car users to intensify the use of public transportation, e.g. by P&R and mobility hubs.

There will be an update to the SUMP in the spring of 2022 that will include a master plan for cycling, a plan for extending public transportation from road to rail, an increase of parking fees and environmental objectives. The update will be based on several new studies. In addition, the local climate strategy (SEAP) for Brasov is currently being updated. An alignment of the two strategies is planned for the update.

At the local level, discussions are underway about joining the "100 Climate Neutral Cities by 2030" mission. If Brasov decides to participate in the mission, the goal of climate neutrality by 2030 will be incorporated in the SUMP.

5.2.3. Ghent

Ghent's SUMP has been implemented in 2015 and is focusing on the city itself. Still, the neighbouring municipalities have been involved in the process. Concerning the climate targets of the SUMP Ghent's goal is to half CO_2 emissions from transport by 2030 compared to 1990 and to be climate neutral in 2050 (Climate 3.0 Strategy). However, the Flemish Regional Government has climate less ambitious targets than the Municipality of Ghent.

Ghent's transport plan foresees a massive reduction of motorised individual traffic in the city, with the share of cars decreasing by 28% between 2012 and 2030. One of the most prominent measures is the Circulation Plan for road transport (2017) that consists of a division of the city centre into six separate segments that cannot be accessed internally, but only through the ringway R40. This measure is accompanied by massive expansion of walking and cycling infrastructures (and regional tracks), conversion of bus lines into tramways, improvement of commuter trains, strict parking management, and many transport demand management measures. Individual road traffic is subdued to massive traffic calming measures and the introduction of general speed limits. It is Ghent's vision to massively reduce the traffic on the main motorways R4 and E17 or even to remove a motorway bridge.

The development process of the SUMP showed that long discussions preceded its approval. The interesting point was that the local business (shopkeepers, traders, …) were in favour of the plan, since they anticipated increasing revenues. Another success factor was a discussion on the safety of riding bicycles that improved public acceptance for a reduction of car traffic in the city centre. Generally speaking, the municipality was promoting the SUMP, while the Flanders Region was rather hampering it.

While the Ghent Municipality was relatively ambitious regarding plans and implementation, there was some opposition from the Flanders Region. It sometimes seemed the region would rather hamper the implementation of the SUMP in the past, e.g. planning processes have been delayed and providing insufficient funding and little supportive action. Presently only one tramway line out of four lines has been implemented. Additionally, the municipality has as well not been consistent in developing a land-use plan (RUP) that partially contradicts the SUMP. The urban freight plan which foresees water transport of goods, has not been implemented by the municipality, since a distribution centre was not constructed. The impression remains that a gap exists between an ambitious plan and the actual acting of government.

As far as the ex-post monitoring of impacts is concerned, the SUMP itself does not prove whether the planned measures are sufficient to achieve its climate targets. Instead, it is planned to monitor the impacts in the future. Even though the monitoring foresees a large number of indicators, a concrete time schedule is missing, as well as a strategy in case the measures fail to achieve the goals.

5.2.4. Granada

The Sustainable Urban Mobility Plan (PMUS) of Granada has been approved in 2013 and only refers to the city itself. The SUMP is a comprehensive strategy with over 800 pages and very detailed description of the planned measures, especially for the urban districts. The plan foresees a massive expansion of public transport, walking and cycling, combined with traffic calming and parking management. This should cause a significant modal shift (number of trips) from private vehicles to public transport.

Environmental impacts of the measures are only qualitatively assessed. The climate mitigation related topics are discussed in the SUMP (at the last pages). From an outside view, the section about the climate mitigation targets contains some implausibilities and rough assumptions. The resulting target is to cut half of the CO_2 emissions in Granada municipality from 2012 to 2025. However, the scenario calculation states that the number of individual motorised trips will increase by 40%. This makes it difficult to understand, how the goal can be achieved. One driver is the assumption that the average trip length will be reduced from 3 km in 2012 to 1.5

km in 2025. Overall, the impression prevails that the section on the climate mitigation goals has not been strongly aligned with the rest of the SUMP and its measures. The SUMP itself focuses on the reduction of traffic related problems, such as congestion, noise and pollution.

The actual implementation seems to contrast the ambitious goals of the plan. Even though the plan has been developed by the administration with massive involvement of the public, little has been actually implemented so far due to political and public resistance of the citizens and especially of local shopkeepers. Additionally, there are political conflicts between the municipality and the Andalucia Region and little cooperation is happening in practice.

A short inspection on site revealed that in 2021 deficits regarding implementation of the planned measures may be observed. The centre of the city still has large car traffic volumes, and buses do not have priority at traffic lights. Bicycle tracks are missing entirely in the city centre – but have been implemented in the outskirts where space is sufficiently available and no conflicts with car traffic exist.

5.2.5. Greater Manchester

The Greater Manchester Transport Strategy 2040 (SUMP of Greater Manchester) was first published in 2017 and updated in 2021 and has been developed in close collaboration with Transport for Greater Manchester (TfGM), Greater Manchester Combined Authority (GMCA) and the local authorities. This approach is intended to ensure that transport investments are supported by new housing and commercial development sites which could be taken forward in future spatial plans. The SUMP sets out Greater Manchester’s long-term ambition for transport and considers the large-scale agglomeration of Manchester. The strategy aims to contribute to Greater Manchester's overall target of being carbon neutral by 2038. The Five Year Transport Delivery Plan is part of the Transport Strategy and sets out the shorter-term measures, schemes and development work. The plan outlines current programmes and sets out how Greater Manchester is developing its future transport programmes in terms of funding, delivery and ways of working. The Five Year Delivery Plan includes local implementation plans for the years 2021 to 2026 for each of the 10 Greater Manchester municipalities (Bolton, Bury, Manchester City, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan). These Local Implementation Plans detail in each local authority how the local outcomes will be achieved, summarise key local transport issues and opportunities in each local authority to provide an additional level of local detail and establish a programme of priority local transport measures. It is envisaged that each Local Implementation Plan will be maintained as a 'live' document over a period of time and updated as local authorities develop and publish transport plans and policies (e.g. Local Plan Documents) or as new schemes are developed or implemented. In terms of monitoring, the

local authorities of each district and TfGM have committed to jointly develop a monitoring framework to measure the success of the measures set out in the respective implementation plan. It is anticipated that this framework will include targets to measure success against the outcomes of the Local Implementation Plan, carbon targets and modal share targets. Manchester City's Implementation Plan states that the city's direct emissions must be reduced by 50% between 2020 and 2025 to meet the city's carbon budget and become carbon free by 2038 (as per the city's Manchester Climate Change Framework 2020-2025 reduction targets). However, the Greater Manchester Transport Strategy does not contain any concrete quantitative climate targets (besides the target of carbon neutrality by 2038). Regarding sectoral responsibility, it is assumed that the share of the sector's current emissions (approx. 40 % for transport) determines the reduction target for the respective sector, i.e. it is derived from the overall target.

At the heart of the SUMP of Greater Manchester is the Right Mix target, setting a quantitative modal split target. The Right Mix vision aims to improve the Greater Manchester's transport system in a way that car use is reduced to a maximum of 50% of daily journeys, with the remaining 50% made by public transport, walking and cycling. This means that by 2040, around one million additional journeys per day will be made by sustainable modes of transport in Greater Manchester.

City regions in the UK receive support for sustainable transport strategies from the national level in the form of funding. In Greater Manchester, these funds will be used for measures that are firmly anchored in the 2040 Strategy and Implementation Plans. In addition, transport improvements to Greater Manchester's local networks are funded through the GMCA capital programme. The Five Year Transport Development Plan shows the current capital programme for the different programme areas (in 1'000 £): Bus network: 43,825; Metrolink network: 438,912; Rail network: 4,750; Streets: 350,555; Integrated network: 84,505.

The 5-Year Environment Plan for Greater Manchester (5YEP) and the SUMP are broadly aligned as the climate strategy (5YEP) has been developed in cooperation with the Delivery Plan (which is part of the Greater Manchester Transport Strategy 2040). However, it is recognised that the current Right Mix used in the Transport Strategy 2040 does not align with the ambitions of the 5YEP strategy. The Right Mix vision refers to the target of reducing carbon emission by 80% from 1990 levels by 2050 under the Climate Change Act 2008. The 5YEP strategy, on the other hand, is based on the carbon budget calculated by the Tyndall Centre for Climate Change Research. The Tyndall carbon budget is the maximum total emissions at sectoral and sub-national levels that can be emitted while limiting the increase in global average temperature to 2°C, in line with the Paris Climate Agreement. The Tyndall Centre, in collaboration with GMCA and the consultancy firm Anthesis, has developed the SCATTER toolkit (Setting City Area Targets

and Trajectories for Emissions Reduction)[17]. SCATTER gives local authorities, regions and organisations their own 'carbon budget'. The model includes 40 measures, each of which can be set to four different levels to create a range of scenarios for achieving the carbon budget. In this way, SCATTER contributes to making meaningful, evidence-based changes to combat climate change and helps authorities align their actions with global commitments.

The measures proposed in the Five Year Delivery Plan are to be reviewed in light of any changes to the Right Mix vision to reflect carbon targets. According to TfGM, work is currently underway to identify a potential new 'low or zero carbon right mix'. It remains to be seen whether this will ultimately be determined by carbon targets alone. Both the ability to achieve it in practice and other strategic objectives may compete with this aim. As TfGM is not the developer of the SCATTER model, they cannot lever inputs. Therefore, over the last two years, TfGM has developed its own models to quantify carbon emissions from transport, using local data aligned with the 2040 Transport Strategy. The models use three main inputs: modal share, energy mix (electricity generation) and fuel mix (vehicles) – and is largely complete.

5.2.6. Grenoble

The Plan de Déplacements Urbains 2030 de l'Agglomeration Grenobloise (SUMP of the metropolitan area of Grenoble) was approved in November 2019 by the committee of the Syndicat Mixte des Transports en Commun (SMTC). The SUMP of Greater Grenoble tackles perspectives on urban development, infrastructure and mobility services, as well as the implementation of parking policies, modal shift and car use development.

The strategy sets qualitative and quantitative targets for the transportation sector of Greater Grenoble and its 450'000 inhabitants. The transport related CO_2 emissions are projected to decrease by 47% by 2030 compared to 2015 levels. The CO_2 targets are derived by multimodal models that consider factors such as demographic and employment development and others. Various scenarios were examined, which had no major differences in methodology and approach. The selection process of the scenarios had the main objective to find a scenario which achieves an equilibrium between the environmental impacts and the social impacts, i.e. to find a scenario which enables a massive reduction of CO_2 without leaving parts of the population behind. Therefore, a special focus was given to ensure that socially disadvantaged families are also better off.

The SUMP of the metropolitan area of Grenoble contains a range of measures. Besides an expansion of commuter rail and tram services, there are concrete measures to establish transport hubs across the city and the agglomeration area. New bus lines and a densification of

[17] https://tyndall.ac.uk/news/mayor-manchester-launches-low-carbon-city-toolkit-tyndall-manchester/

existing services in interaction with an expansion of bus priority lines should lead to a further strengthening of the bus services. The non-motorised transport is to be massively increased by the new cycling network Chronovélo which connects the outer suburbs via cycling highways with the city centre. In interaction with further single cycling tracks, the rental bike service Métrovélo and more bike parking areas, the bicycle traffic will be strengthened in all aspects. A similar concept to the cycling network Chronovélo is planned for the pedestrian traffic. The private car traffic will be gradually restricted by reducing existing road and roadside parking capacities, speed limits and a reduction of long-term parking for non-residents. Further measures include funding of sharing services as supporting employers organizing carpools as well as an upgrade of the existing Grenoble Bastille cable car service.

Urban freight transport will benefit from the establishment of logistic hubs in the city centre, funding measures of fossil-free logistics and alternative modes of transport to the road. On the other hand, there will be an introduction of environmental zones prohibited for the most polluting commercial vehicles. These measures are intended to reduce emissions from urban freight transport, which is responsible for 40% of traffic-related greenhouse gas emissions, 35% of traffic-related particulate matter emissions and 47% of traffic-related nitrogen oxide emissions.

Concerning the implementation of measures, a deliberate renunciation of prioritisation was chosen. The idea is to implement all measures at the same time and to see all measures as a whole, in order to achieve the best possible results. In general, however, the main focus of measures lies on rail-bound transport. This is also reflected in the distribution of the budget, about 50% of which is dedicated to rail-bound measures. The total investments for public stakeholders and road operators amount to 2.2 billion euros between 2018 and 2030. With 832 million euros, the main part of the financial plan is foreseen for the construction of additional rail tracks between Grenoble and Moirans and for the expansion of the Grenoble-Lyon link. The measures envisaged in the SUMP have been subject to a financial study in order to identify the necessary investment and operating costs for public stakeholders and infrastructure managers. The financial plans for the measures are estimates prepared in consultation with the other public bodies and infrastructure managers who are the developers of the projects concerned. As the measures are at different levels of study and planning, the degree of accuracy of the cost estimate also varies: some estimates based on studies at the pre-project or project stage are relatively accurate; other measures, where studies are not as advanced, have been assessed using ratios based on experience of similar projects already carried out; finally, some measures requiring more detailed description have been assessed using a scale representing the ambition of the measure.

An annual monitoring is the permanent steering tool for the implementation of the SUMP. It consists of an annual collection of quantitative and qualitative indicators to inform all stakeholders about the progress of the implementation of the measures, possible difficulties and the observable impacts of the SUMP. This annual monitoring, presented in the form of an indicator, will provide the necessary information for possible adjustments needed during the SUMP implementation to improve the final results. The creation of this indicator will be carried out by the SMTC with the participation of its partners. The SUMP indicator is presented to the SMTC partners every year during a "SUMP Monitoring Committee". This time frame allows the process to be revitalised and corrective measures to be proposed or appropriate solutions to be found in the event of any difficulties. Moreover, in line with its will to develop an ambitious participative policy, the SMTC will endeavour to give a place to the inhabitants of the area and the users of the different mobility networks and services in order to enrich the implementation of the SUMP and its evaluation.

The annual mobility and environmental impact monitoring indicator does not allow for a comprehensive assessment of the achievement of the SUMP objectives, but provides indications of ongoing developments. It makes it possible to monitor a number of trends and check whether they are moving in the desired direction, to issue an alert and, if necessary, to propose corrective measures. In the event of an alert, it can prompt the principal to commission additional studies to deepen the analysis of the identified trends. The implementation of the SUMP and the analysis of its impacts must also be assessed taking into account the socio-economic context that affects the development of mobility. In this respect, the evolution of the population and the evolution of jobs at the level of the catchment area, the evolution of fuel prices, the evolution of housing costs, the evolution of the unemployment rate as well as the introduction of measures at regional or national level affecting the purchase of vehicles must be taken into account.

Assessing whether the SUMP objectives have been achieved cannot be done on an annual basis. This is because a sufficiently long time is needed for the implemented measures to have their full effect. Furthermore, measuring certain impacts requires specific surveys and studies that cannot be carried out every year, such as public transport surveys or household surveys. According to the legal obligations, the SUMP is subject to an evaluation after five years. The evaluation will take the form of an overall assessment of the SUMP to determine the relevance of the plan and the achievement of the objectives set. It addresses all the issues addressed in the SUMP and is based in particular on the results of the household survey foreseen in the SUMP.

The last monitoring and impact assessment of the SUMP of 2019 reveals that the transport related CO_2 emissions will decrease by 29% by 2030 compared to 2015 levels. Therefore, the

impact assessment shows a discrepancy between the CO_2 reduction targets formulated in the SUMP and the actually achieved reduction levels. The main finding of the SUMP is that the previously set reduction targets of 47% can only be achieved in combination with further regional and national reduction measures. The SUMP measures cannot be effectively implemented without a national framework to sufficiently reduce emissions in the Greater Grenoble Area.

In addition to the SUMP, there is a climate mitigation plan, approved by the Grenoble - Alpes Métropole in 2020. The Grenoble metropolitan area was the first in France to adopt a climate protection plan in 2005, which was eventually renamed the "Plan Climat Air Energie" (SECAP of the metropolitan area of Grenoble). The Plan Climat Air Energie Métropolitain 2020-2030 has the quantitative target to reduce all cross-sector CO_2 emissions by 50% by 2030 compared to 2005 levels and reduce the energy consumption by 40% by 2030 compared to 2005 within the metropolitan area of Grenoble. The quantitative targets of the SECAP and the SUMP are in theory identical. But the SECAP sets a reduction target for 2030 compared to 2005, the SUMP a reduction target for 2030 compared to 2015. The reason for the actual, slightly lower reduction target of the SUMP (47% compared to 50% reduction of CO_2) is that between 2005 and 2015, a reduction of 3% has already been achieved.

In 2015, the Grenoble metropolitan area was given new responsibilities by law in the areas of energy, urban planning, economic development and tourism. These enable it to act in a more global and cross-sectoral way. Parts of the SUMP are already integrated in the SECAP of Greater Grenoble and as a planned future process to keep the strategies aligned, an increased merge of both strategies is planned. According to the project manager in charge, the SECAP and SUMP of Greater Grenoble should always be a joint measure package.

5.2.7. Karlsruhe

The city of Karlsruhe has achieved an enormous improvement of bicycle infrastructures as planned in its 2013 SUMP (“Verkehrsentwicklungsplan” VEP) and thereby induced a strong increase in non-motorised transport volumes since then. Already before the plan was adopted, a turnaround in transport demand took place in Karlsruhe. The share of bicycle trips increased from 16% in 2002 to 31% in 2018 and represents one of the highest modal shares in Germany. The 2030 goals (20% modal share for bicycle) of the state Baden-Württemberg[18] have been already now more than fulfilled.

One of the most important success factors was the intensive participation of all stakeholders, especially within the administration. Only the personal involvement of other departments, such as environment and civil engineering offices, guaranteed that the different plans and

[18] Verkehrsinfrastruktur 2030, Baden-Württemberg, Ministerium für Verkehr, 2017.

measures were really implemented. One of the most important tasks was to find a consensus about contradicting targets in the plan.

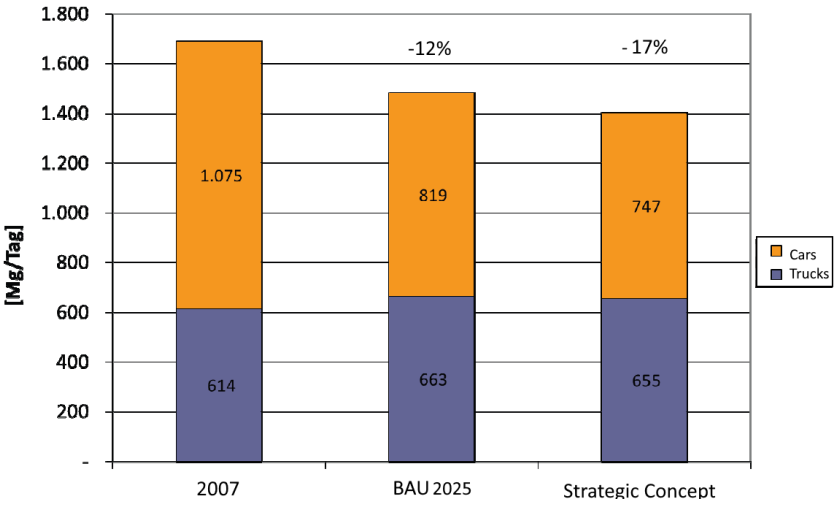
Next to the measures for non-motorised transport, the expansion of public transport is a strong focus of the SUMP. However, the SUMP includes also some road infrastructure measures, e.g. a second bridge over the Rhine and parts of a northern bypass, both being heavily discussed in the public during the past decades.

For the assessment of the SUMP, four scenarios for the year 2025 were developed. Scenario 0: business as usual (BAU), scenario 1: accessibility, scenario 2: urban compatibility, scenario 3: environment. The CO_2 emissions of these scenarios are compared to 2007 as presented in Figure 19. The BAU scenario shows a methodological deficit. Even though the vehicle-km by cars and trucks will increase by 5.9% from 2007 to 2025, the CO_2 emissions are assumed to decrease by 12%. This reduction is assumed without any activity of the city. This assumption, most probably based on engine improvements and electrification, may be considered as rather critical, especially taking into account the development in the last decade, where technical improvements where more than compensated by increasing vehicle weights. However, in the light of the expected strong shift towards fossil-free fuels (electrification), this decarbonisation of the fleet might be realistic in the coming 10-15 years.

The environmental scenario 3 foresees a massive dismantling of many roads, which would have major negative impacts in the urban neighbourhoods due to diverted traffic from main roads. This was the main reason why the council rejected the scenario, even though it generated considerable CO_2 reductions of 24% compared to 2007. However, even this radical scenario 3 does not achieve the city's moderate climate goals[19]. Instead, based on the three scenarios, a Strategic Concept for 2025 ("Handlungskonzept") was developed, mainly including measures from scenario 2. The net CO_2 reduction of the Strategic Concept compared to BAU amounts to only 5%, which was criticized by the consultants: "The established reduction targets … are thus clearly missed" (SUMP/VEP part 3, p.43).

[19] The consultants criticised this scenario as being too low, since "common reduction targets – such as the goal of the Climate Alliance of European Cities to reduce CO_2 emissions by 10% every 5 years – are clearly missed. Even the "2-2-2 target" of the city of Karlsruhe, which envisages an annual reduction of CO_2 emissions by 2% from 2009 to 2020 and requires a reduction of above 27% when extrapolated to 2025.

Figure 19: CO_2 emission of the BAU Scenario and the Strategic Concept (SUMP, 2025) compared to 2007 emissions



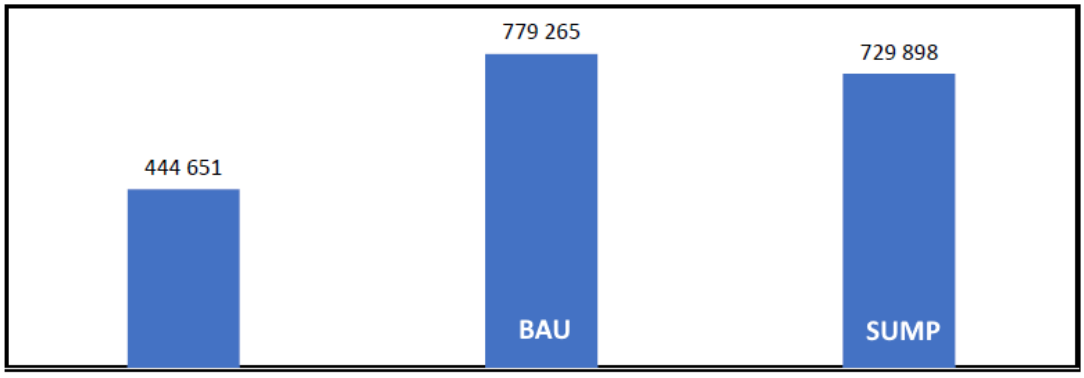
Monitoring in Karlsruhe is taking into account the implementation of measures, as well as the impacts of the plan. A monitoring of the implementation was conducted in 2016 which revealed that out of 141 measures only 26 have not been implemented since 2013. The city conducts an impact monitoring based on new household census in 2018 and new measures will be included in the next version of the SUMP in 2025. Monitoring of the impacts is much more laborious, since the city has to update its traffic software frequently. Thus, time periods for impact monitoring are longer.

5.2.8. Kaunas

The Kaunas SUMP, approved in 2019, is a very innovative plan, that includes many new technologies and planning approaches: city toll, low emission zone in the centre, electronic parking management, ITS, expansion of non-motorised and public transport, development of urban subcentres, etc. However, the plan includes as well major investments in roads, such as repair and extension of intercity roads, Kaunas city eastern bypass to divert freight traffic, upgrading of the section of A1 between the A1/A5 and A1/A6 intersections and the construction of a bridge.

The document states that a 50% reduction of CO_2 emissions (1990-2030) is envisaged and climate neutrality to be achieved in 2050. However, the plan shows a different picture when looking at the expected impacts of the plan: a 64% increase in vehicle emissions is foreseen up to 2030, which is a 6% reduction of emissions compared to the BAU scenario. Thus, the scenario results for the expected greenhouse gas emissions do not meet the overarching climate mitigation targets.

Figure 20: Scenarios for CO_2 emissions by road vehicles in tonnes of CO_2 per year.



Source: DJMP2018, p.213

One of the most interesting measures is a road charging system in the centre of the city. It is planned to be implemented in 2023 through electronic pricing. The fees will be charged per hour when entering the low emission zone. However, charges will only slightly exceed present parking fees.

The government was financing the SUMP development through EU funding. It was strictly reviewed if the SUMP was aligned with the national guidelines. Before, the EU SUMP guidelines had been adapted to the national conditions in Lithuania, i.e. a national guideline has been developed. The guidelines determine the local climate targets. It was strictly controlled that Kaunas SUMP complies with the national guidelines and no national funding was provided for measures that are not included in the SUMP.

Present SUMP guidelines have some shortcomings and are therefore presently update. New guidelines will be developed up to 2022. The major changes in the guidelines are:

- Concept of SUMPs on the regional level (broader area)
- Delimitation of SUMPs according to functional zones (including commuter traffic)
- Ex-ante calculation of future CO_2 emissions according to the measures developed in the SUMPs
- Ex-post monitoring of impacts on CO_2 emissions. (today only implementation)
- New logistics concepts

These issues will need to be included in the next version of Kaunas SUMP.

5.2.9. Stockholm

Stockholm's Urban Mobility Strategy was published in 2012, before the implementation of the official SUMP guidelines. The strategy provides guiding policies regarding the city's streets to promote a more efficient, safe, attractive, environmentally friendly and healthy Stockholm in

line with the Vison 2030, a general description of Stockholm in 2030, and the City Plan, a planning document to achieve the Vison 2030. The SUMP aims at reducing greenhouse gas emissions of transport in the region by 30%[20] by 2030. This climate target for transport was derived from the Stockholm Agreement of 2007. The Stockholm Agreement is the result of negotiations between the Swedish government, the City of Stockholm, the County Council and the other municipalities in the county about which new roads and railway lines should be built in the next ten years and how they should be financed. The long-term vision referred to in the strategy is the goal of fossil-fuel free road transport by 2050. In the meantime, new strategies have been developed (e.g. the Strategy for a fossil fuel-free Stockholm by 2040 and the Climate Action Plan 2020-2023). The climate strategy sets quantitative targets for the transport sector: reduction of transport emissions by 70% by 2030 compared to 1990 and phase out fossil fuels in transport by 2040. The emissions target of the 2012 Urban Mobility Strategy is therefore not aligned with the climate targets for the transport sector from the Climate Strategy.

The Urban Mobility Strategy of Stockholm has four overarching goals: Capacity, Accessibility, Attractiveness and Sustainability. For each goal, different objectives are described. The strategy itself proposes some measures to achieve the objectives, but for the specification of the measures the SUMP refers to topic-specific action plans (e.g. cycling plan, pedestrian plan, freight traffic plan, parking plan, transit network plan, road safety programme). The SUMP summarises the proposed measures in a table and shows qualitatively which measures contribute to achieving the set objectives. However, the impact of the measures on the individual objectives is not quantified. The focus of the SUMP is on the goals themselves and not on the way to get there. The SUMP also does not provide information on the sources of funding nor the costs of the measures.

Stockholm is considered a pioneer in introducing a congestion charge to promote alternative modes of transport in the city centre, improve air quality and reduce traffic congestion. After a trial in the first half of 2006, the congestion charge was made permanent in Stockholm in the summer of 2007. The average traffic volume decreased by about 18-20 % after the introduction and has remained relatively stable since then, despite a growing population.

Overall, the Stockholm SUMP is seen as a good practice example, mainly since it was a pioneer and role model in 2012 before the implementation of the SUMP guidelines. In the meantime, other processes and strategies have gone further. The Urban Mobility Strategy of Stockholm was renewed last year, and it will be adopted in the political bodies in the coming months. The new strategy is expected to come into force as the new Stockholm SUMP in summer 2022. According to the interviewee, the new SUMP was to some extent aligned with the climate

[20] The reference year is unclear. We assume 1990 is the reference year.

strategy by involving relevant representatives in the work, but also by using the targets already presented in the climate plans and strategies.

5.2.10. Toulouse

The Projet Mobilités 2020.2025.2030 (SUMP of the metropolitan area of Toulouse) was approved in February 2018 by the Committee of the Syndicat Mixte des Transports en Commun (SMTC) and presents the revision of the SUMP of 2012. The metropolitan area of Toulouse, with its current population of more than 1.2 million, disposes of a SUMP since 2001, which was revised for the first time in 2012. The revision was necessary to meet the need to implement new public transport projects that can handle the increasing demand and consider new forms of shared and collaborative mobility made possible by the new technologies.

The transport sector has been responsible for 56% of total greenhouse gas emissions in the metropolitan area of Toulouse in 2013, which equals around 3 million tons of CO_2 in 2013. The SUMP measures shall lead to CO_2 reductions per capita by 14% by 2030 compared to 2013 levels. Compared to 1990, the amount of CO_2 emitted per capita shall even decrease by more than 40% by 2030. Despite the significant emission reductions, the SUMP will still lead to an increase of transport volume in kilometres per year of 33% between 2015 and 2030.

The scope of measures planned in the SUMP of Greater Toulouse is wide. It ranges from a new metro line Toulouse Aerospace Express, that creates a direct link between the city centre and the airport with its Airbus plant, to the new cable car service Téléo connecting the university and its existing metro station with a municipal hospital and the Oncopole Institute. Furthermore, an expansion of the Linéo bus network and a densification of existing regular bus services is planned to strengthen the public transport. Measures concerning the non-motorised transport include the development of the Cycle Express Network that extends over 300 kilometres and the improvement of pedestrian networks. Besides the funding of sharing services and the fostering of intermodality, a new freight transport plan is being developed. In the organisation of the logistics chain, goods pass through different platforms or collection/unbundling centres before the last mile. In order to limit the access kilometres and optimise the freight transport plans, considerations are given to the location and distribution of these sites at the level of the large agglomeration. Another measure is the development of a comprehensive parking strategy with differentiated tariff policy and intensive controls. This includes setting maximum and minimum tariffs, especially for parking in employment zones if they are efficiently served by the structuring public transport network.

The new metro line Toulouse Aerospace Express is mentioned as the central measure action of the SUMP with costs of 2.33 billion euros which represents 60% of the financial plan. In total,

86% of the financial resources are related to measures improving the public traffic, 7.5% to bicycle traffic improving measures and 6.5% to road traffic improving measures. In total, the financial plan consists of three parts covering nearly 4 billion euros:

- Basis program (including construction of new cable car line, expansion of existing metro line A and Linéo bus network): 1.351 billion euro,
- Program Metro line Toulouse Aerospace Express: 2.33 billion euro,
- Program Connection of metro line B with Toulouse Areospace Express: 0.183 billion euro.

The SUMP of Toulouse is monitored with the help of environmental assessments. The method chosen for the environmental assessment of the SUMP 2018 aims to ensure that implementation is both voluntary and reactive, i.e. the environmental assessment is considered both as an opportunity to clarify and strengthen the spatial concept and as a legal obligation that is part of a SUMP as well as it is seen as an interactive and iterative process that continuously accompanies the revision of the SUMP, rather than just the document that must ultimately account for this process. In total, a combination of ex ante, in itinere and ex post monitoring is carried out for the SUMP. The monitoring is based on a system of indicators that can be used to monitor the state of the area's environment on the one hand and to evaluate the impacts of the projects on the other. The results of these impact assessment are fundamental for adjustments being tackled in further revisions.

Besides the SUMP, there is a climate mitigation plan for Greater Toulouse, approved in 2017 by the Council of the Métropole Toulouse. The Plan Climat-Air-Énergie Territorial de Toulouse Métropole (SECAP of the metropolitan area of Toulouse) has deposited a CO_2 reduction target of 40% by 2030 compared to 2008 levels. Due to the different reference years, the reduction targets of the SUMP and the SECAP are not directly comparable.

5.2.11. Vienna

Vienna has an overarching long-term framework strategy, the Smart City Vienna Strategy. This framework strategy contributes to the future viability of the city and defines goals in the fields of energy, mobility, buildings and infrastructure. Based on this overarching framework, short-term specialised concepts, programmes and sectoral strategies are concretised. Thus, the thematic concept of the transport sector, the Urban Mobility Plan Vienna (SUMP), is inherently aligned with the overarching framework strategy.

The Urban Mobility Plan Vienna of 2015 contains a quantitative climate mitigation target for mobility: CO_2 emissions caused by transport in the Vienna's road network shall decline by around 20% by 2025 compared to 2010. In concrete terms, this target means a decrease of between 1.7 and 2.1 million tonnes/year. The SUMP does not include any long-term targets (2030

or 2050 targets). However, the SUMP refers to the long-term framework strategy (Smart City Vienna) which sets long-term CO_2 emission reduction targets for the transport sector: 50% CO_2 emission reduction per capita by 2030 and 100% CO_2 emission reduction per capita by 2050.

The commitment to the European energy and climate targets was already set forth in the Smart City Vienna framework strategy. Detailed target levels, especially for the reduction of greenhouse gas emissions, were translated into figures applicable to Vienna. The current Smart City Vienna strategy and the SUMP are not linked to overarching national climate targets. The targets are based on a model that calculates Vienna's emissions for all sectors. The target paths result from these calculations. The methodology is based on the methodology used by the national government. However, a new framework strategy is currently being developed that will update the methodology. Furthermore, the new strategy will be aligned with the new national climate targets (climate neutrality for Austria by 2040). New sectoral concepts will then be developed from the new framework strategy, including a new urban mobility plan (SUMP).

The SUMP states impact targets (e.g. CO_2 emission reduction and modal split) for the entire strategy, i.e. the quantitative impacts are not differentiated by the different measures. The expected contribution of the individual measures to the achievement of the different objectives is described qualitatively in the strategy.

The SUMP does not include any costs or budget, neither for the individual measures nor for the strategy as a whole. In Vienna, financial plans are never part of a strategy paper, as strategy papers are not directly supported by the financial administration. Financing is only concretised in the downstream planning processes and takes place on a project basis.

The administration of the City of Vienna is responsible for the ongoing internal monitoring of the implementation of the measures and their impacts. A comprehensive evaluation is prepared every five years, the result of which is presented to the Municipal Council with the involvement of the districts. The local CO_2 emission data are available via the Vienna Emission Register (emikat.at). No evaluation has yet been carried out.

To ensure that the climate strategy and the mobility strategy are aligned, the relevant departments and stakeholders are equally involved in the process. A mobility team was established to accompany the entire process of the development and implementation of the strategy. In addition, much emphasis was placed on intensive political coordination from the very beginning, which made it possible to achieve better political support. Experience shows that there are some legal and financial framework conditions that hinder the implementation of the SUMP. Therefore, the focus of the new strategy will not be on developing new measures, but on implementing the existing ones.

5.2.12. Vilnius

The Sustainable Urban Mobility Plan of Vilnius is focussing on the city area of Vilnius. The SUMP has been published in 2018. The plan includes clear and ambitious climate mitigation targets. Total CO_2 emissions of transport are to be reduced by 50% until 2030 (compared to 2017). There is also a relative climate target: The per capita emission of CO_2 from mobility shall be reduced by 53% until 2030. The targets are aligned with the national objectives of Lithuania, set in the national energy and climate plan. On the other side, the targets and measures of all Lithuanian SUMPs (around 20) are integrated in the national climate plan. The ambitious climate mitigation target of -50% by 2030 is almost in line with the new EU goal of -55%. The new EU goal will be integrated in the actualisation of the SUMP, which is planned in around two years.

In Lithuania, the national government is supporting the cities in the development of the SUMPs. The transport ministry developed special SUMP guidelines for Lithuanian cities and sets targets for the cities (e.g. on how to consider sustainability issues). The national level has an important role for knowledge transfer, motivation and funding of the measures. In near future, the national ministry will update their targets and SUMP guidelines (e.g. including new subjects such as digitalisation, automation, drones). Then, all SUMPs in Lithuania need to be updated.

The SUMP includes a single scenario, called “optimal SUMP scenario”. This scenario has been developed in a process with stakeholders by discussing and choosing measures and actions. The “optimal SUMP scenario” has been the basis for calculating the expected impacts on mobility demand and CO_2 emissions. The result of the expected impacts has then been taken as the 2030 target of the SUMP.

Initially in the SUMP process, there was no explicit ex-post monitoring planned. But last year, the city started to build up an ex-post monitoring. From 2022 on, the monitoring will be implemented. The ex-post monitoring of the SUMP includes a set of indicators, including modal split, greenhouse gas and other emissions. The monitoring will be done annually for the next three years, until the next version of the SUMP is published. The monitoring has a focus on the achievement of the targets and the implementation of measures. If the targets are not achieved, adjustments and corrective measures are taken. If measures are not implemented or additional measures are necessary, they will be added in an ongoing process. Therefore, Vilnius is steadily updating its action plan of the SUMP with (initially) more than 100 measures. Further adjustments of targets and measures are foreseen in the next update of the SUMP in 2023.

Until now, there is no local climate mitigation strategy in Vilnius. There is only a climate and energy strategy on national level (see above). On the city level, the development of a local climate and energy plan has just started. An alignment with the SUMP and an involvement of the responsible mobility experts is expected.

In the Vilnius SUMP, the most important measures are related to public transport, in terms of their impact on modal shift and climate mitigation. The main measures include new bus lines, new BRT lines, densification of public transport services and the electrification of the bus fleet. Additionally, there is a broad set of measures to promote cycling, such as new cycling networks including cycling highways, bike parking and bike sharing. It cannot be assessed whether the set of measures foreseen is sufficient to achieve the ambitious climate goals.

The SUMP entails a detailed cost assessment for all measures and the strategy as a whole.

5.2.13. Wroclaw

The SUMP of the city of Wroclaw was published in 2019. The strategic document sets quantitative targets for the modal split: by 2020, the share of non-car transport (public transport, cycling and walking) should be at least 60%, by 2024 at least 65% and by 2028 at least 70%. However, the SUMP does not include quantitative climate targets for the transport sector. One of the reasons is that Wroclaw does not collect up-to-date data on CO_2 emissions in the transport sector (the last data date back to 1990).

As part of the SUMP, a very detailed assessment of the existing mobility situation in Wroclaw was carried out. In this separate document, the current transport situation was analysed according to different topics (e.g. walking, cycling, public transport, spatial planning). Furthermore, the mobility behaviour was described according to population groups (e.g. pupils, pensioners).

In a stakeholder workshop, the objectives of the SUMP were divided into very important, important and less important. At the same time, the measures were prioritised (very urgent and less urgent). The result is a matrix that illustrates the prioritisation of all measures and objectives. According to this approach, the measures with the highest priority are the Wroclaw tram programme, the development of public transport in connection with new residential and working areas, the improvement of pedestrian access to the city centre and the traffic zoning in the city centre and downtown area. The SUMP does not include a specific budget or cost plan for the measures. However, it lists possible sources of funding for specific measures and the municipal bodies responsible for them. In the next version of the SUMP, there will be more concrete planning in terms of budget and responsibility of the city administration (and not only the transport authorities) to facilitate the implementation phase.

Annual monitoring is planned to track the progress of SUMP implementation. For this purpose, 36 indicators are monitored, and the results of the monitoring are documented in the form of reports. However, among the 36 indicators, there are no indicators that measure climate impacts (e.g. emission levels).

The mobility strategy for Wroclaw mainly focuses on the city itself. However, it also integrates some measures for the surrounding agglomeration and thus takes commuter traffic into account (e.g. expansion of the park-and-ride and bike-and-ride system, expansion of the agglomeration railway with new stations within the city limits, a coherent system of interchange stations within the functional area and the coordination of tariffs within the city and the agglomeration area).

A SUMP is currently being developed for the functional area of Wroclaw, which includes 38 municipalities (public consultation is planned end of 2021). The preparation of a document for 38 different municipalities requires a high level of coordination and, above all, an accurate assessment of the current situation. Among the 38 municipalities there are urban, rural and mixed (urban-rural) areas. The delimitation of the functional area was mainly based on a comprehensive traffic census from 2018. The survey provided important information about daily trips in Wroclaw and neighbouring municipalities. All participating municipalities signed a contract legally defining the principles of cooperation.

A core team for the SUMP preparation process of the functional area has been formed. Each municipality is represented in this core team. The representative of the City of Wroclaw is responsible for ensuring that the objectives and indicators of the two strategies (city and metropolitan SUMP) are aligned. In addition, the Low-Emission Economy Plans of individual municipalities and the functional area were analysed and taken into account when planning the measures of the SUMP.

The SUMP of the Wroclaw functional area will focus on promoting electric mobility, investing in zero-emission public transport, limiting car traffic within the city and expanding park-and-ride stations.

The SUMP of the City of Wroclaw and the local climate and energy strategy (SECAP) were prepared separately due to the organisational structures in the city administration. Unlike the SUMP, the SECAP was developed within one department, without any exchange with the other departments. In order to take the interdependencies into account, a future edition of the Wroclaw SUMP will include climate-related targets and measures.

The Ministry of Funds and Regional Policy, in cooperation with the Ministry of Infrastructure, the Centre for EU Transport Projects, the European Commission and JASPERS, has implemented a major national SUMP pilot initiative in Poland. The programme aims to support urban centres in preparing a good SUMP, including technical advice for the preparation process, workshops on specific topics and promotion of best practices. The initiative recommends integrating climate action into the SUMP and setting quantified targets. The pilot programme aims to encourage local authorities to take comprehensive measures to design urban mobility. It also aims to transfer knowledge and best practices to local government units. The implementation of the

contract should contribute to the standardisation of planning documents in line with the latest European Commission methodology and to the dissemination of the SUMP tool for urban spatial and mobility planning.

5.3. Synthesis and main findings

5.3.1. Overview of main findings per case study

A major goal of the case studies was to identify success factors and best practice factors on the one hand, and barriers or difficulties on the other hand. As in the whole study, the main focus is on the climate change mitigation in mobility. The following table shows the main findings of the 13 case studies, highlighting the strengths and success factors as well as obstacles and weaknesses of the strategies.

Table 5: Main findings of the case studies

Case Study / City	Success factors, highlights, strengths	Obstacles, weaknesses
Bologna	▪ Covering the whole metropolitan area ▪ Joint development of the SUMP by the metropolitan area and the city (community) ▪ Stringent and broad organisation including technical experts, directors – as well as scientific advisors and politicians ▪ Strong citizen participation during development ▪ High level of awareness of the SUMP in the public → increases acceptance for measures ▪ Stringent ex-post monitoring with two cycles	▪ Cooperation between city and municipality in implementation only voluntary ▪ Involvement of the metropolitan area – as it is made in Bologna – not pushed forward enough by the EC ▪ No impact assessment for single measures (but only for the plan as a whole)
Brasov	▪ After four years of implementation, more than 80 % of the measures have been realised ▪ Four times as many diesel buses replaced by electric buses than originally foreseen ▪ SUMP covers the whole functional (metropolitan) area → joint realisation by city and metropolitan area	▪ Time constraints and administrative ambiguities ▪ Lack of impact of measures
Ghent	▪ Strict targets and strong measures to limit private transport in the centre ▪ Increasing revenues anticipated → local business in favour of the plan to reduce car traffic in the city centre ▪ Discussion on safety of riding bicycles improved public acceptance for reduction of car traffic in the city centre	▪ Conflicts between municipality and region, hampering implementation
Granada	▪ Massive expansion of public transport, walking and cycling, combined with traffic calming and parking management, with the aim of shifting from individual transport to public transport ▪ Ambitious quantitative climate targets	▪ Implementation at odds with ambitious goals. Political and public opposition from citizens and local shopkeepers hampers implementation ▪ Political conflicts between the municipality and the Andalucia Region and lack of cooperation

Case Study / City	Success factors, highlights, strengths	Obstacles, weaknesses
Greater Manchester	▪ SUMP covers the whole metropolitan area and its functional area ▪ Five Year Delivery Plan (part of the Transport Strategy) includes local implementation plans for all municipalities of Greater Manchester ▪ SUMP well aligned with other strategies of Manchester area	▪ No concrete quantitative climate targets (besides the goal of carbon neutrality) ▪ Modal split target not aligned with climate strategy (Tyndall budget)
Grenoble	▪ Very comprehensive and wide range of measures ▪ SUMP covers whole agglomeration (functional area), previous SUMP was limited to the city of Grenoble ▪ Annual monitoring as a permanent steering tool for the implementation of the SUMP, presented in the form of an indicator ▪ Evaluation every five years taking the form of an overall assessment of the SUMP ▪ Strong focus on rail-bound transport and the combination of rail-bound transport modes with the new cycling network Chronovélo connecting the outer suburbs via bicycle highways with the city centre. This network will also serve as a role model for a similar pedestrian network.	▪ Delays in the planning and implementation phases ▪ Implementation highly disturbed and slowed down by the COVID-19 crisis
Karlsruhe	▪ Enormous improvement of bicycle infrastructures, strong increase in non-motorised transport volumes (e.g. increase in share of bicycle trips from 16% in 2002 to 31% in 2018) ▪ Intensive participation of all stakeholders, especially within administration ▪ Monitoring of 2016revealed that out of 141 measures only 26 have not been implemented since 2013	▪ Climate targets of SUMP not aligned (less ambitious) with city's overarching climate objectives ▪ Massive dismantling of roads lead to negative impacts in urban neighbourhoods due to diverted traffic from main roads ▪ Very ambitious decrease of CO_2 emission factors of the vehicle fleet in BAU scenario
Kaunas	▪ Very innovative plan, including many new technologies and planning approaches ▪ SUMP development financed through EU funding. EU SUMP guidelines adapted to the national conditions in Lithuania and strict review of alignment between SUMP and national guidelines ▪ No national funding for measures that are not included in the SUMP ▪ Road charging system in the city centre planned for 2023 (electronic pricing)	▪ Discrepancy between total CO_2 emission reduction target and scenario calculations for the measures. Foreseen greenhouse gas emission reductions are far below the overarching climate targets ▪ Low price level of planned road charging scheme, effect unclear
Stockholm	▪ Early example of comprehensive SUMP including also ambitious climate goals ▪ Congestion charge achieved impact on traffic in city centre	▪ No quantification of impacts ▪ Focus on strategic goals and key areas for action, concrete measures only partly included

Case Study / City	Success factors, highlights, strengths	Obstacles, weaknesses
Toulouse	▪ SUMP covers whole metropolitan area ▪ Wide range of measures, strong focus on improvements and expansion of existing metro network ▪ New means of transport with Téléo cable car service ▪ 86% of financial resources related to measures improving the public traffic, at least 65% related to metro network	▪ No clear alignment of the SUMP with the climate mitigation strategy (SECAP) of Greater Toulouse ▪ Delays in planning major infrastructure projects for roads and public transport, which can have a negative impact on the attractiveness and quality of the living environment. ▪ Modelling does not take into account many societal and behavioural developments that could change the outcomes of a SUMP in the long term (e.g. increase in home office work, autonomous vehicles, significant increase in e-bikes, more urban mix between residential and commercial areas etc.).
Vienna	▪ Within an overarching framework strategy (Smart City Wien), short-term specialised concepts, programmes and sectoral strategies are concretised ▪ Involvement of relevant departments and stakeholders in development process of climate strategy and SUMP to ensure alignment of strategies ▪ Process of development and implementation accompanied by a mobility team	▪ No evaluation (ex-post monitoring) has yet been carried out ▪ No costs or budget included ▪ Legal and financial framework conditions hindering implementation
Vilnius	▪ Development process: High involvement of public stakeholders (with workshops), creating higher acceptance for the SUMP and its measures ▪ Good cooperation between city and the national level (e.g. for knowledge transfer). Sustainable mobility supported by national level (e.g. national funding of measures)	▪ Lack of money and funding hampers implementation of measures ▪ Lack of knowledge on SUMP development ▪ Some measures lack impact on sustainability
Wroclaw	▪ Very detailed assessment of the existing mobility situation ▪ Stakeholder participation in development process ▪ Transparent prioritisation of measures ▪ Consideration of commuter traffic ▪ Ongoing development of SUMP for functional area, aligned with city's SUMP	▪ No quantification of climate targets ▪ No environmental indicators (e.g. emission levels) ▪ Implementation hindered by lack of political will

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Based on the single case studies, there can be derived a) good practices and success factors and b) deficits and obstacles in the SUMPs, regarding climate mitigation in urban mobility.

5.3.2. Good practices observed in the SUMPs

The case studies revealed a large number of success factors and good practices:

- Many of the observed SUMPs have ambitious climate targets which were defined in the introducing chapters.
- Most of the SUMPs analysed in the case studies include quantitative climate targets for mobility. Mostly, these climate targets are accompanied by quantitative transport targets – such as for modal share or transport demand / transport performance.
  The existence of quantitative climate and transport targets is a necessary precondition for the later achievement of ambitious targets.
- The expected SUMP impacts (based on planned measures) should be in line with targets. In many cases the targets have been derived from scenario calculations, including the planned measures of the SUMP.
  The alignment of targets and expected impacts seems to be more important than the alignment with overarching (national) objectives.
- In most cases where a local climate mitigation strategy is available and has been developed at the same time as the SUMP, the targets for mobility have been aligned. A success factor is the mutual involvement of the relevant departments (climate/energy and mobility) in the strategy development process.
- There are several SUMPs covering the whole functional area of the metropolitan area (e.g. Bologna, Brasov, Greater Manchester, Grenoble, Toulouse). Since transport relations between the core city and its surroundings are very close and of high relevance, the mobility strategies and the setting of objectives should rather include the whole functional area.
- If the development of the SUMPs is conducted by committed and experienced staff, this is a success factor for the development of ambitious plans.
- A stringent and well-functioning organisation with clear processes is a key factor for a successful development of a SUMP. This means that all relevant stakeholders of the administration need to be involved tightly (e.g. Karlsruhe, Bologna, Wroclaw, Vilnius). Only the personal involvement of the relevant departments besides transport – such as environment and civil engineering offices – will guarantee that the plans ware really implemented.
  A good involvement of the different stakeholders of the administration helps to tackle differences or contradicting targets in the plan.
- Additionally, the involvement and persuasion of the relevant politicians is crucial. This can be reinforced, for example, by a highly accepted expert group building a bridge between the administrative developers of a SUMP and the decision-makers (see example of Bologna).

- Strong citizen participation during the development of the plan is another important success factor, increasing public acceptance of the plan and the measures (e.g. Bologna, Ghent).
- A stringent ex-post monitoring of a) the implementation of the measures and b) the target achievement is important for the success of a SUMP. The monitoring needs to involve clear responsibilities, a time frame and a defined process in case of non-achievement of goals. In that case, corrective actions need to be planned. The regular update of a SUMP is necessary and needs to take into account the target achievement so far.
- If the national level gives certain specifications or guidelines for the SUMP, this is helpful and increases the acceptance of the development process. E.g. in Italy, the national government expects the SUMPs to focus on the entire metropolitan area. In Lithuania, the national ministry of transport developed national SUMP guidelines.
  If the financing of the SUMP and its measures is linked to certain conditions, this also strengthens the content of the SUMP. In Lithuania, for example, the funding of urban mobility measures is only provided if a SUMP is available and has been developed according to the national SUMP guidelines.
- In most of the plans, the key measures include, on the one hand, the promotion of walking and cycling and, on the other hand, the (comprehensive) expansion of public transport (infrastructure and services). Push measures (e.g. like economic instruments, charges) have not been planned so frequently until now, although they are essential for reaching ambitious sustainability goals.

5.3.3. Main deficits of the analysed SUMPs

The analysis of the case studies also showed several deficits or obstacles. The potential deficits relate to the following subjects: Definition of climate targets, the methodology used, the implementation and the ex-post monitoring.

Deficits regarding the climate targets:

- Climate mitigation targets are often not aligned with the overarching targets the city has agreed upon (e.g. through the Covenant of Mayors).
- In some cases, there is no control whether the impacts of the planned measures are sufficient to achieve the climate targets (alignment of targets and expected impacts of the measures).
- In case the assessment of the impacts revealed a non-achievement of the targets, the plan and its measures are often not adjusted.

- The selection process of a scenario was often not made transparent enough. Sometimes the ambitious climate reduction scenario was not selected by the policymakers, although this already implied a non-achievement of climate targets in advance.
- The environmental scenario in Karlsruhe SUMP is a good example for the level of impacts needed to achieve climate targets. The scenario foresees a massive dismantling of roads and road space accessible for motorised vehicles, leading to major negative impacts in the urban neighbourhoods due to diverted traffic from main roads into the quarter. This again was a main reason for the rejection of the scenario by the council, although it would have led to significant CO_2 reductions. However, even this quite radical scenario was too low to achieve the city's climate mitigation goals.

Methodological deficits:

- In several cases, the impacts of planned measures are not assessed at all. This entails that the compliance with the climate targets cannot be controlled.
- The climate related impacts of the planned measures are sometimes not compared to a reference year (1990 or any other year), but only to the future projections of a business-as-usual scenario. This is understandable in the logic of transport planning methodologies but does not reflect the necessity to achieve the international climate goals, which require an emission reduction compared to 1990 (e.g. 55% reduction compared to 1990 by 2030).
- Cities often confine their SUMP within the boundaries of their municipality. Given the large commuter volumes from neighbouring communities, this approach is not sufficient. For example, the internal transport volume (origin/destination within the city's boundaries) of Karlsruhe amounts to only 41% of the trips, and even much less in terms of transport volume. A regional approach is imperative for climate mitigation.

Deficits in implementation:

- Even though the SUMP document had been adopted by local councils and politicians, the implementation of the concrete measures is often not conducted as foreseen. Planning measures are confronted with public or political resistance. This is especially true for push measures.
- Often the costs of the planned investments are not assessed in the SUMP document and the financing is unclear. This can lead to the measures not being implemented.
- Conflicts between the different levels – e.g. the city and the region – are a significant obstacle for the implementation of the SUMP (e.g. because the funding is not guaranteed).
  In some cases, the planned measures are not within the responsibility of the city, but can

only be implemented by regional or national authorities. Given the missing consent of these authorities, implementation does then not take place.

- Often, the organisation for developing the SUMP – including the different administrative departments and the different geographical level – is only in charge during the development process, but not when the SUMP is being implemented.
- The Covid-19 crisis and its consequences for transport and economy often negatively influenced and slowed down the implementation of the SUMPs. Due to the strong decrease in public transport, the target achievement will be more difficult (although bicycle and pedestrian transport increased significantly).

Deficits in ex-post monitoring:

- Ex-post monitoring of the target achievement, the impacts of the measures as well as the implementation of measures is often not foreseen. Often, monitoring is mentioned, but a timeframe and responsibilities for monitoring are missing. This increases the risk of non-achievement of the targets.
  Whereas the monitoring of the implementation of measures is rather straightforward and more often done, the ex-post monitoring of their impacts is much more laborious.
- Mostly, the mechanism (process) in case of non-achievement of the targets are not defined in the SUMP. This may prevent corrective action.

6. Summary of findings and authors' recommendations

In this chapter, the main findings and conclusions of the study are summarised (chapter 6.1). In the end, a short outlook with recommendations form the authors for the future planning process is given (chapter 6.2).

6.1. Summary of findings of the study

The analysis of the sustainable urban mobility plans and the local climate mitigation strategies – based on a broad screening of such strategies as well as in-depth case studies – led to the following **main findings**:

- The broad screening of the SUMPs showed that on average around 30% of the SUMPs screened include quantitative climate targets for mobility. Most of the targets include relative (in %) reduction targets for greenhouse gas emissions until 2030 or 2020 (for older plans).

  The majority of the other SUMPs also address climate change mitigation as an overlying goal - but do not include quantitative targets.
- The analysis showed significant differences regarding city size, year of approval and region:
  - *City size:* Large cities include more often quantitative climate targets for mobility in their SUMPs. In cities with more than 500'000 inhabitants, more than 50% of the SUMPs include quantitative climate targets, whereas this ratio is only around 10-15% in cities below 250'000 inhabitants.
  - *Year of approval:* SUMPs recently developed show a significantly higher share of quantitative climate targets: Before 2010, the share of SUMPs with quantitative targets was around 10%. Between 2010 and 2018 the ratio was around 20-30%. Since 2019, this share has increased substantially. Almost half of the most recent SUMPs include quantitative climate targets for mobility. It can be assumed that this has also been a consequence of the increasing relevance of the climate issue in public and political discussion.
  - *Region:* The regional analysis shows that all European regions cover a large number of SUMPs. When looking at the share of SUMPs with quantitative climate targets for mobility, the share is highest in Western and Southern Europe (30-40%) and significantly lower in Eastern Europe (around 10%).

  An important precondition for setting quantitative transport and CO_2 emission targets is the availability of a traffic model. Based on such a model, scenario calculations can be carried out and quantitative targets can be derived. This might be a reason why quantitative targets are less frequent in smaller cities.

- The broad screening of the SUMPs led to the following findings:
  - *Planning area:* The majority of the SUMPs focuses on city area, only a minority includes the functional urban area (i.e. the relevant metropolitan area).
  - *A Status quo analysis* of transport infrastructure, demand data and present greenhouse gas emissions is included in most SUMPs.
  - *Climate objectives* are most often not derived from national, regional or EU targets, but mostly from scenario calculations or cross-sectoral city targets for climate mitigation.
  - *Alignment with overarching climate strategies* is only made in a minority of SUMPs. However, this changes when looking at more recent SUMPs, where the embedding in overarching climate strategy is more frequent.
  - *Monitoring*: An ex-post assessment of target achievement and the implementation of measures is foreseen in less than half of the SUMPs analysed.
  - *Measures:* The following are the main types of measures in the SUMPs:
    - public transport: expansion of tram, underground, trolleybus, prioritisation (new infrastructures, denser services)
    - non-motorised transport: improvement of bicycle network as major focus, plus promotion of sharing, bike stations and pedestrian areas.
    - road transport: road safety, parking management, traffic management and (rather rarely) expansion of road network.
- The broad analysis of urban climate mitigation strategies led to the following findings:
  - The majority (60%) of the strategies include clear quantitative climate mitigation targets for mobility.
  - The strategies broadly refer to EU and national targets (NECP).
  - Around 50% of the strategies state that quantitative ex-post monitoring of impacts is foreseen.
  - The main types of measures in the transport sectors included in the urban climate strategies are: enhancing of non-motorised transport; fostering alternative (fossil-free) technologies for vehicles; improvement of rail, tram and bus network; transport demand management measures, such as sharing, parking management and low emission zones.

The more detailed analysis with selected **case studies** of 13 cities of potential good practice examples showed several success factors and highlight, but also deficits and obstacles in the SUMPs, regarding climate mitigation in urban mobility. Based on this, the following conclusions can be drawn:

- The existence of quantitative climate and transport targets is a necessary and important precondition for the later achievement of ambitious targets.

- The expected SUMP impacts (based on planned measures) should be in line with targets.
- Where an overarching local climate mitigation strategy exists, the quantitative climate targets for mobility should been aligned. A success factor is the mutual involvement of the different relevant administrative stakeholders in the strategy development process.
- It is recommended that the SUMPs include the whole functional area of a metropolitan area and not only the city, since transport relations between the core city and its surroundings are very close and of high relevance.
- A stringent and well-functioning organisation with clear processes is a key factor for a successful development of a SUMP. This means that all relevant stakeholders of the administration need to be involved tightly.
- Additionally, the involvement of the relevant policymakers in the development process is crucial. However, the involvement should not stop there, but go on during the implementation phase.
- Citizen participation during the development of the plan is an important success factor, increasing public acceptance of the plan and the measures.
- A strong involvement of the national level for the development of SUMPs seems to be a success factor. Some countries have developed national guidelines for their SUMPs, which increases the acceptance in the development process. If the financing of the SUMP and its measures is linked to certain conditions, this also strengthens the content and success of the SUMPs.
- A stringent ex-post monitoring of the target achievement and the implementation of the measures is crucial. The monitoring process needs to be clear in terms of responsibilities, time frame and the process in case of non-achievement of goals.
- Implementation is the main obstacle: The good practice examples mostly have ambitious targets and a consistent set of measures. However, the implementation of the measures has not been working well in many cities in the past. Therefore, it must be doubted whether the ambitious climate targets of the SUMPs can be achieved overall. Up to now –as in the entire mobility sector – ambitious climate mitigation targets have not been achieved in almost any case.
- The problems during implementation increase the relevance of rigorous monitoring and controlling. It is important that corrective actions are taken in case of non-achievement of targets. Regular updating of the SUMP is necessary and must take into account the achievement of targets to date.
- The forthcoming expected rapid electrification of the vehicle fleet will lead to a substantial decrease in greenhouse gas emissions thanks to this overarching trend. Cities will benefit from that and be "gifted" a significant CO_2 reduction with almost no additional effort (besides

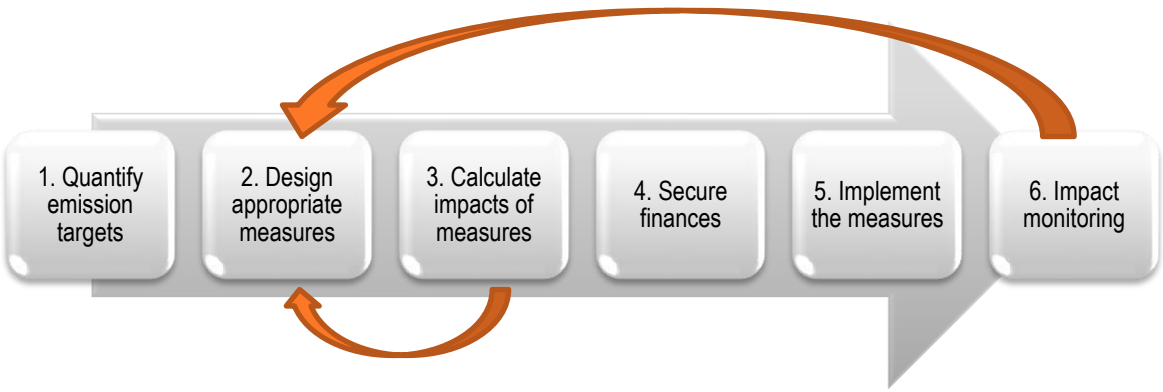
e.g. the provision of charging stations). There is a risk that this trend will hinder cities (and also regions and states) from additional ambitious goals regarding modal shifts and transport volume reductions – that would be necessary to achieve the ambitious European climate mitigation targets (-55% until 2030).

- High importance of good planning at implementation phase: Many of the obstacles observed could be mitigated with adequate and circumspect planning of the implementation and monitoring phase. This includes a robust analysis and identification of the needs, a stakeholder consultation and participation process – and then an in-depth analysis of the financial needs for the implementation and the operation and maintenance phase. There needs to be set up a sound financial programme that is able to cover the financial requirements of the measures – during the construction as well as the operation phase. As stated before, the implementation phase also needs to be accompanied by an adequate monitoring of the actual implementation in line with the plan.

6.2. Authors' recommendations and outlook

Planning that effectively combats the climate crisis must reverse present practices that are based on an extrapolation of past development trends and planned for ever increasing road expansion. Instead of forecasting future growth, **backcasting** that sets future maximum emission levels as target values is needed. The main question to be answered is which measures can most efficiently reduce CO_2 emissions in mobility to the required level. This implies to cap future CO_2 emissions from mobility, for example by setting an allowable annual CO_2 budget that is reduced over time and finally leads to decarbonisation of the transport sector in 2050. For that, a procedure is suggested that can be described as a six-step model:

Figure 21: Suggestion for a process as a six-step model



Source: own illustration.

Two feedback loops are included. Firstly, if the ex-ante calculated sum of impacts is lower than the targets, the measure must be reviewed and strengthened until the goals are achieved. Secondly, it is crucial that the realised effects on mobility and climate emissions are measured ex-post. Again, if targets are not met, corrective measures need to be revised and implemented once more.

Most of the SUMPs analysed showed deficits in one of the six steps (more detailed explanations are provided in section 5.3). The analysis in this study provides some indications on how the required quality control for the sustainable implementation of SUMPs in general and EIB/JASPERS projects in particular could be improved.

- For the planning phase, represented by step 1 to 4, a methodological guidance document on Climate Mitigating Planning (Climate SUMP) would be a good guidance for EIB/JASPERS staff or local planners. Some basic ideas have been presented already in chapter 4.4 and 4.5.
  A first step is now planned with the development of a "SUMP Topic Guide on Climate Change Mitigation" by EIB/JASPERS. This Topic Guide is planned to serve as a supporting document for planners in urban areas.
- For the implementation phase, represented by the steps 5 and 6, the represent project does only deliver preliminary and incomplete results, mainly based on the interviews with the responsible planners. The authors' impression is that deficits in implementation are a major obstacle for sustainability. However, thorough empirical evidence is missing on the causes. This might be missing stakeholder integration, insufficient participation of other departments, lack of funding, low public acceptance, political resistance or lacking public pressure. A more in-depth empirical review of the planning and implementation process and the assessment of impacts might reveal additional evidence on these issues.
- For the development and the implementation process, a quality monitoring of SUMPs would be a possible action to a) increase the quality level of the SUMP, b) improve the development process and c) make the ex-post monitoring and the readjustment process more stringent and stricter. The quality monitoring could be done by an external supervisor/expert. Altogether, a stricter quality monitoring is expected to result in a higher achievement of climate targets.

Annex

A1 Analysis criteria for sustainable urban mobility plans (SUMPs)

Table 6: List of criteria for the analysis of sustainable urban mobility plans (SUMPs)

Criteria category	Screening criteria
Eligibility	▪ Land ▪ Urban area ▪ SUMP Award finalist (yes/no) ▪ Screening: Eligible for further investigation
Administrative issues	▪ Population size ▪ Population category ▪ Approval date ▪ Lead Institution ▪ Type of instruments (strategy, program, investment program) ▪ Planning Area (City only, Agglomeration, not specified)
Status quo analysis	▪ Assessment of existing transport infrastructures (yes, no, partly) ▪ Quantification of CO_2 emissions of transport (yes, no, partly)
Climate goals	▪ Specific climate change mitigation targets mentioned (yes, no, partly) ▪ How are targets set for mobility? (qualitative objectives, quantitative targets, other) ▪ How are the targets derived? ▪ Which type of mobility measures are covered? ▪ Reference of targets (none, NECP, EU, …) ▪ Targets clearly quantified, i.e. % or ton reduction, target year, reference year (yes, no) ▪ CO_2 Reduction Target 2030 compared to 1990 ▪ CO_2 Reduction Target 2050 compared to 1990 ▪ Are specific CO_2 reduction targets for urban freight transport mentioned? (yes/no/unclear) ▪ How were the key measures selected in relation to the climate change mitigation objectives? ▪ To which extend are SUMPs embedded into an overarching, integrated, and cross-selectorial local climate strategy? ▪ What is the national/regional level doing to support cities in addressing climate change with their SUMPs?
Planned transport interventions	▪ Road improvement (no, new, expand existing capacities, downgrade, maintenance, safety, others) ▪ Rail improvement (no, light rail, metro, commuter rail, other) ▪ Bus improvement (no, bus line, BRT line, bus network, BRT network, other) ▪ Cable car (no, new, upgrade) ▪ Non-motorised transport (no, walking, cycling tracks, cycling network, cycling highways) ▪ Transport Demand Management TDM (parking management, city toll/road charging, sharing services, Intelligent transport Systems ITS, other) ▪ Measures to improve urban freight transport ▪ Financial Plan: (no, cost assessment, financial plan, budgeting for communal household) ▪ If possible: share of planned costs (no cost mentioned, road, Public transport, NMT, TDM, other)

Criteria category	Screening criteria
Target achievement	▪ Quantification of the impacts of all measures on CO_2 emissions (yes, no) ▪ Is there a local data available to determine, monitor and set targets for CO_2 emissions? ▪ Are the impacts in line with the set of climate targets? (NECP/EU achieved, not achieved, unclear) ▪ Are there discrepancies from the forecast? (yes/no) ▪ Are adjustments necessary to achieve the targets? (yes/no) ▪ How have the quantifications been performed? (e.g. based on relevant traffic model) ▪ Scenario Calculations. Has the scenario with the strongest CO_2 impacts been selected?
Ex-ante monitoring	▪ Ex ante monitoring planned (no, implementation, impacts) ▪ Mechanism for refinement of planned measures planned (yes/no)

Table INFRAS. Source: own source.

A2 Analysis criteria for urban climate strategies

Table 7: List of criteria for the analysis for urban climate strategies

Criteria category	Screening criteria
Eligibility	▪ Land ▪ Urban area ▪ Screening: Eligible for further investigation
Administrative issues	▪ Population size ▪ Approval date ▪ Lead Institution ▪ Type of instruments (strategy, program, investment program) ▪ Planning Area (City only, Agglomeration, not specified)
Status quo analysis	▪ Assessment of existing transport infrastructures (yes, no, partly) ▪ Quantification of CO2 emissions of transport (yes, no, partly)
Planned transport interventions and targets	▪ Specific climate mobility targets mentioned (yes, no, partly) ▪ How are targets set for mobility? (qualitative objectives, quantitative targets, other) ▪ How are the targets derived? ▪ Targets clearly quantified, i.e. % or ton reduction, target year, reference year (yes, no) ▪ Quantified targets ▪ Which type of mobility measures are covered? ▪ How concrete are the measures (distinct, medium, vague)? ▪ Enforcement of alternative drive technologies (yes, no) ▪ Road improvement (no, new, expand existing capacities, downgrade, maintenance, safety, others) ▪ Rail improvement (no, light rail, metro, commuter rail, other) ▪ Bus improvement (no, bus line, BRT line, bus network, BRT network, other) ▪ Cable car (no, new, upgrade) ▪ Non-motorised transport (no, walking, cycling tracks, cycling network, cycling highways) ▪ Transport Demand Management TDM (parking management, city toll/road charging, sharing services, Intelligent transport Systems IST, other) ▪ Others ▪ Freight transport ▪ Financial Plan: (no, cost assessment, financial plan, budgeting for communal household) ▪ If possible: share of planned costs (no cost mentioned, road, Public transport, NMT, TDM, other) ▪ How were the key measures selected in relation to the climate change mitigation objectives? ▪ What is the national/regional level doing to support cities in addressing climate change with their SUMPs? ▪ Is there a SUMP? (yes, no) ▪ Targets in line with SUMP? (yes, no)

Criteria category	Screening criteria
Climate goals	▪ Specific climate change mitigation targets mentioned (yes, no, partly) ▪ Reference of targets (none, NECP, EU, …) ▪ Targets clearly quantified, i.e. % or ton reduction, target year, reference year (yes, no) ▪ Quantified target ▪ Targets in line with EU goals? (no, 40% goal, 55% goal)
Target achievement	▪ Quantification of the impacts of all measures on CO2 emissions (yes, no) ▪ Is there a local data available to determine, monitor and set targets for CO2 emissions? ▪ Are the impacts in line with the set of climate targets? (NECP/EU achieved, not achieved, unclear) ▪ Are there discrepancies from the forecast? (yes/no) ▪ Are adjustments necessary to achieve the targets? (yes/no) ▪ How have the quantifications been performed? (e.g. based on relevant traffic model)
Ex-ante Monitoring	▪ Ex ante monitoring planned (no, implementation, impacts) ▪ Mechanism for refinement of planned measures planned (yes/no)

Table INFRAS. Source: own source.

A3 List of sustainable urban mobility plans (SUMPs) screened

Table 8: List of sustainable urban mobility plans (SUMPs) screened

Country	City / urban area	SUMP eligible for further investigation (quantitative climate objectives)
Austria	Graz	no
Austria	Vienna	yes
Austria	Villach	no
Belgium	Brussels	yes
Belgium	Brugge	no
Belgium	Deinze	no
Belgium	Gent	yes
Belgium	Liège	yes
Bulgaria	Burgas	no
Bulgaria	Kardzhali	no
Bulgaria	Pleven	no
Bulgaria	Sofia	yes
Bulgaria	Stara Sagora	no
Croatia	Dubrovnik	no
Croatia	Koprivnica	no
Croatia	Novigrad	no
Croatia	Sisak	no
Croatia	Zagreb	no
Cyprus	Larnaca	no
Cyprus	Limassol	no
Cyprus	Nicosia	yes
Czech Republic	Brno	no
Czech Republic	Budweis	no
Czech Republic	Olomouc	no
Czech Republic	Ostrava	no
Czech Republic	Pilsen	no
Czech Republic	Prague	no
Denmark	Aarhus	no
Denmark	Copenhagen	no
Denmark	Odense	no
Denmark	Randers	no
Estonia	Tallinn	yes
Estonia	Tartu	no
Finland	Helsinki	yes

Country	City / urban area	SUMP eligible for further investigation (quantitative climate objectives)
Finland	Hyvinkää	no
Finland	Lahti	no
Finland	Tampere	no
Finland	Turku	no
France	Angoulême	no
France	Chartres	no
France	Clermont-Ferrand	no
France	Grenoble	no
France	La Rochelle	yes
France	Lille	no
France	Lyon	yes
France	Marseille	yes
France	Nantes	no
France	Paris	yes
France	Rennes	yes
France	Strasbourg	no
France	Toulouse	yes
France	Valence	no
France	Vannes	no
Germany	Bad Kreuznach	yes
Germany	Berlin	yes
Germany	Bremen	yes
Germany	Dresden	yes
Germany	Aalen	no
Germany	Freiburg	yes
Germany	Konstanz	no
Germany	Heidelberg, Mannheim, Ludwigshafen	no
Germany	Region Stuttgart	yes
Germany	Ulm/Neu-Ulm	no
Germany	Flensburg	no
Germany	Frankfurt / Rhein-Main	yes
Germany	Görlitz	no
Germany	Halle (Saale)	no
Germany	Hürth	no
Germany	Karlsruhe	yes
Germany	Kassel	no
Germany	Köln	no

Country	City / urban area	SUMP eligible for further investigation (quantitative climate objectives)
Germany	Leipzig	yes
Germany	München	no
Germany	Passau	no
Germany	Region Stuttgart	no
Germany	Stuttgart	no
Germany	Trier	no
Greece	Thessaloniki	no
Hungary	Budapest	yes
Hungary	Debrecen	no
Hungary	Pecs	no
Hungary	Szeged	no
Ireland	Clonmel	no
Ireland	Dublin	no
Ireland	Galway	no
Ireland	Limerick	no
Italy	Bari	no
Italy	Bologna	no
Italy	Bolzano	no
Italy	Brescia	no
Italy	Ferrara	yes
Italy	Genua	no
Italy	Milan	no
Italy	Modena	no
Italy	Napoli	yes
Italy	Palermo	yes
Italy	Parma	no
Italy	Perugia	no
Italy	Ravenna	no
Italy	Reggio Emilia	no
Italy	Rome	no
Latvia	Vidzeme	no
Latvia	Riga	no
Lithuania	Druskininkai	no
Lithuania	Kaunas	yes
Lithuania	Klaipeda	no
Lithuania	Vilnius	yes
Luxembourg	Luxembourg	yes

Country	City / urban area	SUMP eligible for further investigation (quantitative climate objectives)
Malta	Valletta	no
Netherlands	Amersfoort	yes
Netherlands	Amsterdam	no
Netherlands	Den Haag	yes
Netherlands	Dordrecht	no
Netherlands	Ede	no
Netherlands	Groningen	no
Netherlands	Limburg	no
Netherlands	Rotterdam	no
Netherlands	Tilburg	yes
Netherlands	Utrecht	yes
Poland	Gdansk	no
Poland	Gdynia	no
Poland	Koszalin	no
Poland	Krakow	no
Poland	Lublin	no
Poland	Olsztyn	no
Poland	Warsaw	no
Poland	Wrocław	no
Portugal	Braga	no
Portugal	Coimbra	yes
Portugal	Faro	no
Portugal	Lisbon	yes
Portugal	Porto	no
Portugal	Viseu	no
Romania	Bucharest	no
Romania	Cluj Napoca	no
Romania	Constanta	yes
Romania	Craiova	no
Romania	Iasi	no
Romania	Timisoara	no
Romania	Turda	yes
Slovakia	Bratislava	no
Slovakia	Presov	no
Slovenia	Celje	no
Slovenia	Koper	no
Slovenia	Kranj	no

Country	City / urban area	SUMP eligible for further investigation (quantitative climate objectives)
Slovenia	Maribor	no
Slovenia	Ljubljana	no
Slovenia	Ljutomer	no
Spain	Barcelona	yes
Spain	Bilbao	yes
Spain	Burgos	no
Spain	Granada	yes
Spain	Léon	no
Spain	Madrid	yes
Spain	Murcia	no
Spain	Palma	yes
Spain	Vitoria-Gasteiz	no
Sweden	Gothenburg	yes
Sweden	Malmö	no
Sweden	Örebro	no
Sweden	Stockholm	yes
Sweden	Umea	no
Switzerland	Luzern	no
Switzerland	Zurich	yes
Switzerland	Basel	no
United Kingdom	Aberdeen	no
United Kingdom	London	yes
United Kingdom	Greater Manchester	yes

Table INFRAS. Source: own figure.

A4 List of urban climate mitigation strategies screened

Table 9: List urban climate mitigation strategies screened

Land	City / urban area	Strategy eligible for further investigation (quantitative climate objectives for mobility, mobility issued covered in detail)
Austria	Vienna	no
Croatia	Rijeka	maybe
Cyprus	Strovolos	yes
France	Toulouse	yes
Germany	Berlin	no
Germany	Bremen	no
Germany	Dresden	yes
Germany	Frankfurt am Main	no
Germany	Karlsruhe	yes
Germany	Stuttgart	yes
Hungary	Budapest	no
Italy	Bologna	yes
Italy	Milan	maybe
Italy	Parma	yes
Italy	Pesaro	yes
Poland	Wrocław	yes
Portugal	Maia	maybe
Romania	Bacău	yes
Slovakia	Prešov	no
Spain	Sagunto	yes
Spain	Trento	yes
Sweden	Gothenburg	yes
Sweden	Stockholm	yes

Table INFRAS. Source: own figure.

A5 Fact Sheets Case Studies

See separate documents with the 13 fact sheets of the case studies.

Literature

Agora Verkehrswende 2018: Supporting a U-Turn in Parking Policy: Facts and Figures. www.agora-verkehrswende.de

Doll, Claus 2016: Die Rolle Der Nutzen-Kosten-Analyse im BVWP 2030; Wirkungen, Alternativen, Perspektiven, BUND-Workshop: Bundesverkehrswegeplan, Landesvertretung Baden-Württemberg, Berlin,26.9.2016.

European Commission 2013: A Concept For Sustainable Urban Mobility Plans To The Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions; Together towards competitive and resource-efficient urban mobility, COM(2013) 913 final, ANNEX.

European Commission 2020: Sustainable and Smart Mobility Strategy – putting European transport on track for the future, {SWD(2020) 331 final}.

European Commission 2021: Evaluation Of The 2013 Urban Mobility Package COMMISSION STAFF WORKING DOCUMENT, {SWD(2021) 48 final}.

European Court of Auditors 2020: Sustainable Urban Mobility in the EU: No substantial improvement is possible without Member States' commitment.

European Passenger Transport Operators EPTO 2021: EPTO views on the upcoming revision of the Urban Mobility Package.

González, Rosa Marina et al 2019: Analyzing CO_2 emissions from passenger cars in Europe: A dynamic panel data approach, Energy Policy Volume 129, June 2019, Pages 1271-1281.

HEATCO 2006: Developing Harmonised European Approaches for Transport Costing and Project Assessment, Deliverable 6, Case Study Results, Contract No. FP6-2002-SSP-1/502481.

International Association of Public Transport UITP 2019: Transforming Cities with Bus Rapid Transit (BRT) Systems, How to Integrate BRT?

Joint Research Centre 2013: Analysis of National Travel Statistics in Europe, OPTIMISM WP2: Harmonisation of national travel statistics in Europe, JRC83304, doi:10.2788/59474.

Mobilität in Deutschland 2017: in infas, DLR, IVT und infas 360 (2018) (im Auftrag des BMVI).

Müller, P., Schleicher-Jester, F., und TOPP, H. 1992: Konzepte flächenhafter Verkehrsberuhigung. In: Flächenhafte Verkehrsberuhigung – Folgerungen für die Praxis. Herausgeber: Bundesministerien für Verkehr, für Umwelt und Reaktorsicherheit, für Raumordnung, Bauwesen und Städtebau, Bonn.

Newman, Peter and Jeff Kenworthy 2021: Gasoline Consumption and Cities Revisited: What Have We Learned?, Current Urban Studies, 2021, 9, 532-553.

Rupprecht Consult 2019: Guidelines for Developing and Implementing a Sustainable Urban Mobility Plan, Rupprecht Consult (editor), European Platform on Sustainable Urban Mobility Plans, Second Edition, 2019.

Transport for London 2008: Central London Congestion Charging, Impacts monitoring, Sixth Annual Report.

Werlan, Stefan 2019: Financing and funding options for Sustainable Urban Mobility, 6th European Conference on Sustainable Urban Mobility Plans Groningen, 17-18 June 2019.

Werlan, Stefan and Frederic Rudolph 2019: Funding and Financing of Sustainable Urban Mobility Measures (Wuppertal Institute).

Wuppertal Institut 2020: CO_2-neutral bis 2035: Eckpunkte eines deutschen Beitrags zur Einhaltung der 1,5-°C-Grenze. Wuppertal.