SCALE-UP
User-Centric & Data Driven Solutions for Connected Urban Poles

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D1.5: Guidelines & recommendations for other cities/urban areas on the SCALE-UP strategies for vertical & horizontal upscaling 1

Version 0.6

SCALE-UP

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SCALE-UP | [D1.5 Guidelines & recommendations for other cities on SCALE-UP strategies for vertical & horizontal upscaling 1]

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List of acronyms	
Acronym	Meaning
ASI	Avoid-Shift-Improve
ATR	Antwerp Transport Region
CRTM	Consorcio Regional de Transportes de Madrid
EC	European Commission
EMT	Empresa Municipal de Transportes
EV	Electric Vehicle
FG	Focus Group
FUA	Functional Urban Area
GDPR	General Data Protection Regulation
ICT	Information and Communications Technology
IPCC	Intergovernmental Panel on Climate Change
LEM	Local Evaluation Manager
LEZ	Low Emissions Zone
MaaS	Mobility as a Service
ML	Measure Leader
NMS	New Mobility Services
PPP	Public-Private Partnership
P&R	Park&Ride
PT	Public Transport
SECAP	Sustainable Energy & Climate Action Plan

SCALE-UP | [D1.5 Guidelines & recommendations for other cities on SCALE-UP strategies for vertical & horizontal upscaling 1]

SUMP	Sustainable Urban Mobility Plan
TR	Transport Region
TRA	Transport Region Authority
UN	United Nations
WP	Work Package

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Legal disclaimer

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This deliverable is a draft document subject to revision until formal approval by the European Commission.

Contents

SCALE-UP | [D1.5 Guidelines & recommendations for other cities on SCALE-UP strategies for vertical & horizontal upscaling 1]

List of figures

List of tables

1. INTRODUCTION

1.1. Context and aims of this document

WP1 addresses the framework to **develop, implement, and validate strategies for vertical and horizontal integration** in SCALE-UP urban nodes (Antwerp, Madrid, and Turku) and beyond. Its main tasks are to develop **a framework** for effective strategies on the **vertical upscaling and integration across the different layers** (physical, digital, human), to realise **meaningful cooperation** between SCALE-UP urban nodes, to **validate strategies** on vertical and horizontal integration and to **develop guidelines and policy recommendations** for strategies of integration (D1.5) All mentioned aligns with SCALE-UP's main goal: to develop user-centric and data-driven strategies, to enhance the take-up of **smart, clean, and inclusive mobility**, through **well-connected** and **multi-usage** urban nodes, in a consistent and comprehensive manner. The frameworks proposed by WP1 are presented in strategies for vertical upscaling (D1.1) and horizontal integration (D1.2). For this, input from WPs 2-6 and findings from WP7, along with external input (Focus Group discussions) were used.

D1.1 and D1.2 serve as input for this document, **D1.5: "Guidelines and recommendations for other cities/ urban areas on the SCALE-UP strategies for vertical and horizontal upscaling".**

The **main objective** of this deliverable is to present the **analysis and integration** of the different tasks in WP1 and feedback from WP2-7 as **guidelines and recommendations**.

For this, **Chapter 1** presents a **synthesis of the existing planning framework** in the three nodes and **Chapter 2** introduces **the approach** followed to **diagnose the current status** of the three nodes, the methodology and inputs used. **Chapters 3-5** present the **diagnosis** in terms of **barriers and challenges** for both the implementation of the different city strategies and for the **integration** of the different layers of the mobility system. **Chapter 3** is focused on **multilevel governance**, Chapter 4 on the integration of the physical, digital and human layers and **Chapter 5** includes a wider perspective from experts external to the project. **Chapter 6** presents the **lessons learned** by the actual stage of the project on what to **avoid**-**shift**-**improve** for the success of the measures and for the adequate interaction among the different layers part of the strategy. Finally, **Chapter 7** includes general guidelines and **best practices** from SCALE-UP nodes and from successful experiences of previous projects with **recommendations** on the **integration needed** for reaching the strategy's goal. It is worth mentioning that D1.5 will be revised and updated in M48 as D1.10.

1.2. **WP1 within SCALE-UP project and its links to other WPs**

<u>WP1 and WP7 interactions</u>

WP7 oversees "Monitoring and Evaluation" through the development and implementation of a **three-layered evaluation** approach aligned with the SCALE-UP concept: the SCALE-UP measures' level, the Functional Urban Area level and the strategies for integration layer (TEN-T and the multi-layered mobility system). Part of the interaction between WP1 and WP7 consisted in discussing the most important elements for effective vertical and horizontal integration. WP7 findings are an input for WP1 strategies for integration and for the thematic cooperation in WPs 2-6. However, input is bidirectional, and WP1 will serve as input for the evaluation of the integration of SCALE-UP urban nodes performed in WP7.

<u>WP1 and WP8 + WP2-6 interactions</u>

The 28 measures implemented in SCALE-UP belong to five intervention fields (Governance, Multimodality, Data, Clean safe and inclusive and Behavioural Change), each corresponding to one implementation work package (WPs 2-6). For each of these, a thematic cooperation task is in place, with regular thematic bilateral meetings (Tasks 2.1-6.1) to discuss barriers, challenges and drivers specific to each measure. These discussions have been used as input to develop D1.5, which will be at the same time used as future input for WPs 2-6, as the guidelines and policy recommendations will be useful in the implementation of the measures.

Along with the bilateral meetings mentioned above, WP8 on Knowledge exchange and take-up, is in charge of organizing thematic knowledge exchange webinars around the five fields, at least once a year. These exchanges allow for discussion among the urban nodes in relation to innovative solutions in implementation, as well as detecting common barriers, challenges, drivers, and recommendations, which WP1 takes into account.

1.3. **Existing planning framework**

Current EU guidelines and legislation regarding climate actions and mobility have been elaborated according to the Paris Agreement's (2015)[1] objective to keep the global temperature increase below 2ºC, as well as the UN 2030 Agenda for Sustainable Development[2].

Among the different documents, the White Paper on Transport (2011)[3] sets a reduction of at least 60% of GHGs emissions by 2050 with respect to 1990 in transportation. The European Green Deal (2019)[4] presents a package of policy initiatives for the green transition, with the ultimate goal of reaching climate neutrality by 2050. The EU Climate Law (2021)[5] writes into law the goal to become climate-neutral by 2050, including the intermediate target for 2030 instituted by the 2030 Climate Target Plan. Additionally, the EU is working on the revision of its climate, energy and transport-related legislation under the so-called "Fit for 55 package[6]" in order to align current laws with the 2030 and 2050 ambitions. This package also includes several new initiatives.

The existing planning frameworks of Antwerp, Madrid and Turku are aligned with the EU context regarding climate change and mobility. The main plans and strategies of each of the nodes are presented below.

1.3.1. Antwerp (Roadmap 2030)

Antwerp has three main policy framework plans regarding mobility and climate action: (1) the Climate Plan 2030 (Klimaatplan 2030)[7], (2) Roadmap 2030[8] and (3) the

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[1] Paris Agreement: https://www.un.org/en/climatechange/paris-agreement

[2] UN 2030 Agenda for Sustainable Development: https://www.un.org/sustainabledevelopment/development-agenda/

[3] EU White Paper on Transport: https://op.europa.eu/en/publication-detail/-/publication/bfaa7afd-7d56-4a8d-b44d-2d1630448855/language-en

[4] EU Green Deal: https://www.consilium.europa.eu/en/policies/green-deal/

[5] EU Climate Law: https://climate.ec.europa.eu/eu-action/european-green-deal/european-climate-law_en#formal-adoption

[6] EU "Fit to 55" revision: https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/

[7] Climate Plan 2030: https://antwerpenvoorklimaat.be/proxy/files/download/d878624c-823f-47fb-a9f0-1e2df2357a73

[8] Roadmap 2030: https://www.antwerpenmorgen.be/nl/projecten/klimaatplan-2030/media

Mobility Plan 2030 (Mobiliteitsplan 2020/2025/2030)[9]. The first one comprises the general strategy regarding climate action, while Roadmap 2030 and the Mobility Plan 2030 provide specific measures in relation to energy consumption reduction and efficiency, and the transportation system respectively.

The starting points of Antwerp's framework apart from the common national and EU legislation are the Regional Flemish Energy and Climate Plan 2020-2025, and the Master Plan 2020, which contains measures for the supra-local networks of all modes.

The Climate Plan 2030 (Klimaatplan 2030) is a concrete plan to reduce CO_2 emissions by reducing the energy consumption of living, working and traffic, making it more sustainable. The goal is to make the city a pleasant and healthy living environment, and to ensure affordable and reliable energy supply as well.

Regarding mobility, Climate Plan 2030 proposes an ambitious modal split: reach at least 50% of journeys within the Antwerp Transport Region to be made by other (sustainable) modes than individual cars by 2030. To make this possible, the actions proposed revolve around the improvement of the connection of the whole Antwerp's Transport Region, as well as the infrastructure. In relation to Antwerp's port and freight's transportation, the goal is to increase inland navigation of containers from 38% to 42% by 2030.

The Mobility Plan 2030 provides targets for 2025 ("Perspective 2025") and 2030 ("Target 2030") and is committed to strengthening liveable and safe mobility networks. It sets four strategic themes:

- Strengthen and expand bike routes
- Provide residents and visitors with sufficient parking and parking facilities
- Smooth automobile accessibility for city and districts and improve people-sized streets for residential areas
- Enhance economic growth by making the core areas of the city pleasant.

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[9] Mobility Plan 2030: https://assets.antwerpen.be/srv/assets/api/download/59251c86-b7d3-4680-a7a7-140405af3a5f/mobiliteitsplan_DEF_web.pdf

1.3.2. Madrid (Madrid 360)

Madrid's policy framework[10] has been elaborated not only in line with EU and international legislation, but also national and regional. At the national level, Madrid responds to:

- The Climate Change and Energy Transition Law (2020), which aims to achieve climate neutrality by 2050, decarbonization and the establishment of Low-Emission Zones in municipalities of more than 50,000 inhabitants.
- The Infrastructures, Transport and Housing Plan (PITVI, 2012-2014) to improve efficiency in the transport system.
- The strategy for Safe, Sustainable and Connected Mobility (MITMA 2030)
- The integrated National Plan for Energy and Climate (PNIEC 2021-2030), with the goal of reducing 23% of emissions as compared to 1990.

Additionally, Madrid's Region has its own Strategic Plan for Sustainable Mobility (2013-2025) and the Plan A of Air Quality and Climate Change. Madrid City Roadmap to Climate Neutrality has established the goal of reducing 65% of emissions compared to 1990 by 2030 in order to achieve climate neutrality by 2050, an ambitious goal that goes beyond EU requirements.

The new Plan de Movilidad Sostenible Madrid 360[11] (Madrid 360 Sustainable Urban Mobility Plan) was approved on 10 February 2022 and sets 2030 as a horizon to promote a safe, sustainable, healthy and smart mobility. At the regional level, which includes the FUA, the Strategic Plan for Sustainable Mobility of the Community of Madrid 2013-2025 has objectives aligned with the Madrid 360 strategy and is currently in an upgrade period.

Madrid 360 SUMP is very much aligned with the European Green Deal to be climate-neutral by 2050 and aims to comply with the air quality targets set by the European Union legislation. On Madrid 360 SUMP's strategic approach, public transport is at the backbone of the urban transport system and the overall plan is organized around these main objectives:

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[10] Estrategia Madrid 360: https://www.madrid360.es/

[11] Madrid 360: https://www.madrid.es/portales/munimadrid/es/Inicio/Movilidad-y-transportes/Plan-de-Movilidad-Sostenible-Madrid-360/?vgnextfmt=default&vgnextoid=e3bbf2df82d1f710VgnVCM1000001d4a900aRCRD&vgnextchannel=220e31d3b28fe410VgnVCM1000000b205a0aRCRD

- More and better public transport
- Improvement of transport infrastructure
- Promotion of active mobility (walking and cycling)
- Car parking management, taking into consideration sustainability criteria
- Facilitating modal integration through micro-mobility and intermodality
- Stimulating fleet replacement for less polluting vehicles
- Promoting technological change and optimization of the urban distribution of goods
- Applying innovative technological and logistical elements to optimize the mobility system
- Moving towards safe mobility
- Encourage responsible mobility through education, information and governance.

1.3.3. Turku (MAL 2020-2031)

Turku's Land Use, Housing and Transport Agreement (MAL Agreement)[12] defines a 12-year development path for the Turku Region for the 2020-2031 timeline, based on the objectives of Turku Urban Region. The region comprises the 13 municipalities of the Turku urban area, as well as the Regional Council of Southwest Finland. The purpose of the agreement is to strengthen cooperation between municipalities and national authorities and to provide long-term development to achieve the regional goals.

The main national and regional starting points or the Turku Region MAL Agreement 2020-2031 are:

- The objectives and measures concerning land use, housing and transport set out in the Government Programme of Prime Minister Sanna Marin (10 December 2019)
- International climate agreements and the resulting National Energy and Climate Strategy and Medium-Term Climate Plan (KAISU)
- Parliament's letter on housing policy development priorities (EK 26/2018 VP- o 61/2016 vp)
- The National Transport System Plan under the Law on Roads and Highways
- Turku Region Structural Model 2035
- Turku Climate Plan 2029 (SECAP).

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[12] MAL Agreement: https://ah.turku.fi/kv/2020/0615006x/Images/1824490.pdf

2. THREE-DIMENSIONAL POLICY DEVELOPMENT METHODOLOGY

A three-dimensional methodology (see Figure 1) was used to develop guidelines and recommendations for other cities on the SCALE-UP strategies for vertical upscaling and horizontal integration.

Vertical upscaling includes the analysis and integration of Inputs from D1.1 "Framework for development and implementation of strategies for **vertical** upscaling" and is centred on how mobility strategies are developed and implemented across governance levels. It links up to the SRUMP/SULP cycle/development process, including the related SUMP guidelines, topic guides and practitioners' briefings.

Horizontal integration is based on the inputs from D1.2 "Framework for development and implementation of strategies for **horizontal** upscaling" and mainly focused on the different horizontal layers of the multi-layered mobility system (physical, digital, human). It comprises a **diagnosis** of the status of **the different layers in the urban node** to serve as a starting point in de development of **guidelines and recommendations** to ensure their proper functioning and the correct **integration** among them.

External assessment is the third dimension based on the inputs obtained from the Focus Group (FG) discussions held in the three nodes that include the vision of experts unlinked to the project. It aims to include **external** perspective (from local experts) and further knowledge on **vertical and horizontal integration.**

This combined approach is expected to be enriching and complementary for the development of policy guidelines and recommendations that enable replication and upscaling of different mobility measures in other urban nodes.
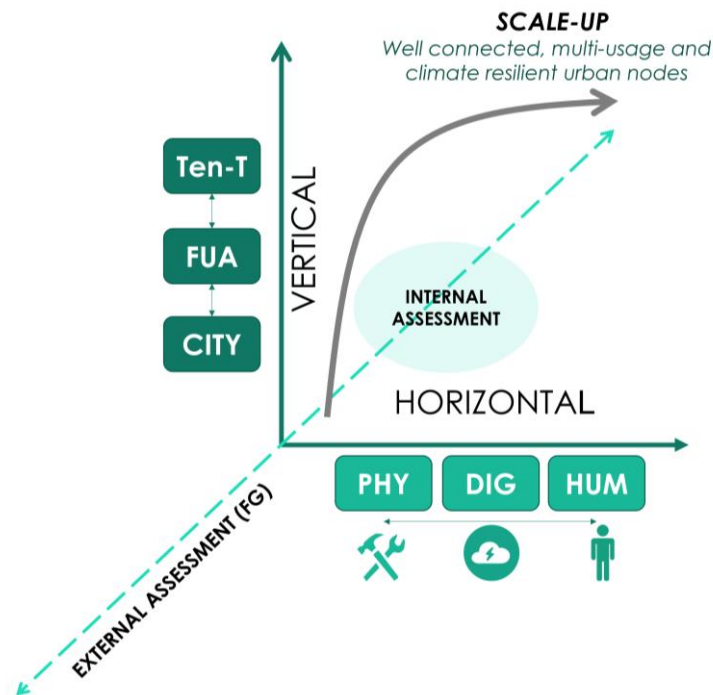
Figure 1: Three-dimensional policy development methodology

2.1. **Diagnosis of the existing vertical integration**

For the diagnosis of the existing vertical integration, it is required to understand the (local) context, the aims/ambitions of the city within the urban mobility strategy but also the aims and role of the other organisations in the Functional Urban Area of the city concerned. As presented in D1.1, the following key questions were addressed.

When a city authority of an urban node wants to upscale their own policy strategy, or specific thematic areas within their strategy to a "higher" level, then:

- What do we define as this higher level? And why is this level preferred?
- Which organisations or other stakeholders do we identify to operate, have mobility competencies, within this higher level? And which impact do organisations, or other stakeholders, have on the effectiveness of the mobility strategy of the city? Why do the cities need these cooperations?
- And why should these organisations and other stakeholders support or cooperate with the city authority: what is in it for them?

To define the vertical upscaling, the definition of what cities actually mean with vertical upscaling was assessed. This analysis was done per work package and per measure within the implementation work packages (WPs 2-6).

2.2. Diagnosis of the current horizontal integration

As it is stated in the D1.2. the assessment of potential barriers and challenges for **horizontal integration** from the perspective of the different stakeholders was based on two different inputs. (1) Results of the thematic cooperation meetings in WPs 2-6, as well as the knowledge exchange webinars from WP8, and (2) Potential barriers and drivers identified by Measure Leaders (ML) and Local Evaluation Managers (LEM) in D7.3 "Mobility baseline in the SCALE-UP FUAs" and D7.4 "Evaluation Plan 2" from WP7, on evaluation and monitoring. To see the complete list of questions raised during knowledge exchange webinars, please see Annex 1 D1.2.

(1) Between 2021 and 2022, there were several thematic cooperation meetings, at least one per urban node for each of the five intervention fields (WPs 2-6). Additionally, there were five thematic knowledge exchange webinars (one per intervention field / implementation WP). To assess the challenges, barriers and drivers for the implementation of the measures, the horizontal approach, including guidance questions, was provided to the measure leaders or thematic cooperation task leaders of the implementation work packages (WPs 2-6). The most relevant findings of these meetings regarding the barriers and drivers for the implementation of the measures and of the current integration among layers in each node served as input for this deliverable.

(2) **Potential barriers and challenges** for the **implementation of the measures** were also identified as part of WP7 "Evaluation and Monitoring" and included in deliverables D7.3 and D7.4.

2.3. External experts' diagnosis of the current situation

The **external assessment** of potential barriers, challenges, drivers, and recommendations has been done through three Focus Group Discussions (FGD) held with external experts on different fields (see 6.2 Annex 2 of D1.2) on the three urban nodes. For this, the **mobility strategy of each node** was discussed looking to identify new or different challenges and barriers than the ones already identified in the thematic and knowledge exchange webinars. This exercise served to have a **wider vision at layer level**, assessing their **actual performance** and **integration** among them. The findings were classified in **six topics**, depending on the area where the intervention is needed: (1) Regulatory, (2) Economic, (3) Transport, (4) ICT, (5) Environment & planning and (6) Social agenda, following the analysis of the FG discussions presented in a detailed manner in deliverable D1.2.

3. MULTI-LEVEL GOVERNANCE FOR VERTICAL INTEGRATION: BARRIERS AND CHALLENGES FOR IMPLEMENTING CITY STRATEGIES

The assessment of the current multi-level governance integration was done for the three urban nodes. The following sections present the main preliminary conclusions drawn for each of them.

3.1. Antwerp

A governance model for the Antwerp Transport Region (ATR) is in place which facilitates the collaboration between stakeholders. However, while the will of working together to create good mobility policy in the region is there, sometimes the implementation of the policy is difficult. The Antwerp Transport Region for example consists of many stakeholders, which creates challenges and asks for extra management. Furthermore, the transport region itself does not have budget, which leads to a certain dependency on the different stakeholders for implementing different actions towards carrying out the mobility policy. This might lead to a delayed implementation.

The Transport Region proposed its monitoring framework for a Roadmap 2030. However, much data is needed for the monitoring of mobility in the region. This data has to be collected from many different stakeholders and sometimes data does not cover all the aspects monitored. While stakeholders are generally willing to provide the necessary data, the collection still requires a good deal of networking and meetings. Also, some data are missing or differ in this way that they cannot easily be compared to each other.

Some of the main barriers identified for the implementation of city strategies in Antwerp are presented below:

- ATR has no legal status, decision power and financial means of its own.
- The competences of the other actors with regard to implementation and financing did not change with the creation of the transport regions.
- The city/region and the Port of Antwerp-Bruges are working as separate entities.
- Decision making is done on the basis of a unanimous vote, which can result in slow decision making and compromises.

- The Team Transport Region is not an entity on its own but consists of different stakeholders detached partly or full-time by mobility-related entities operating within the Antwerp Region.
- Measures at regional level have to be financed by other stakeholders who might have other priorities.
- Small municipalities may lack financial capacity to carry out the policy drawn up for the Antwerp Transport Region.
- ATR is not the concessionaire of the bus and tram services in the region
- Rail transport is not part of the scope of the ATR, so coordination with the national train operating company NMBS is necessary.
- The transport region decides on the location of mobility hubs, but the province of Antwerp on the bicycle infrastructure.
- As MaaS is new, common standards, cooperation and knowledge sharing is difficult to be achieved.
- There is resistance to share data, investing in standards and interoperability.
- There is a big difference between municipalities in terms of in-house knowledge and expertise on mobility.
- Small rural villages don't always see the benefits of working together in the ATR.
- GDPR compliance can be an issue when processing personal data.

3.2. Madrid

In Madrid, mobility measures are always promoted and regulated through agreements between administrations. As well as with sectorial working groups that promote common measures and have periodic meetings with representation of the three public administrations as well as representatives of different sectoral, professional and business areas.

Some of the main barriers identified for the implementation of city strategies in Madrid are presented below:

- Governance works top-down, not bottom-up.
- New forms of mobility and legislation appear that catch the municipalities by surprise.
- Objectives (between the State-Region-City levels) are not always aligned.
- The different political colours between the municipalities and government levels hamper decision making.
- There is no formal structure to promote cooperation among the different actors involved in Madrid's mobility ecosystem.

- Difficulty of the Regional Transport Consortium – CRTM to propose and implement new mobility measures due to the high number of operators they manage.
- The Municipal Transport Company – EMT lacks the competences to upscale successful initiatives to the FUA-level.
- CRTM is only responsible for coordinating public passenger transport in the Community of Madrid. Freight is seen by CRTM as being out of their scope.

3.3. **Turku**

Currently in Turku there is no organization that has a mandate or budget for measures including infrastructure or decision-making at regional level rail commuting. The final decisions are always made in the councils of the municipalities. The interests of the municipalities do not always meet the interests of the region, which leads to conflicts and have a negative impact on the regional sustainable urban mobility objectives.

To minimize this risk, discussions between the municipalities about the regional train network, organisation, cost and other things related started in August 2021. Since then, there have been several meetings, workshops and events, some as a part of SCALE-UP and some on the initiative of municipalities where the railway goes through. These events will help to set a common goal and strengthen the commitment of municipalities.

The main barriers identified in Turku related to multilevel governance are:

- The Region of Southwest Finland has no decision power and financial means of its own.
- Local elected decision makers are part of the regional council, but without mandate for regional decisions.
- The interests of the municipalities do not always meet the interest of the region.
- There is no financial cooperation model between the municipalities at FUA level.
- There is no assessment framework at regional level for the ex-ante evaluation of measures with regional impact.
- Due to multiple stakeholders (state, municipalities), a lack of mandate at regional level / a lack of policy coordination the required multi-modal mobility network is not in place.
- There is rather little crossing over of plans and strategies between sectors and divisions.
- Although there is awareness of the role of freight & logistics on the mobility system it remains underrepresented in planning.

- A clear typology and hierarchy of hubs from a national level is lacking.
- The regional public transport company Föli is a well-established and rather well-resourced actor with a strong capacity to organize transport services. It currently, however, only operates in six municipalities.

4. BARRIERS AND CHALLENGES FOR THE HORIZONTAL INTEGRATION OF CITY STRATEGIES

As explained previously in section 2.2, an assessment of the horizontal integration was carried out as part of implementation (WPs 2-6) and the evaluation (WP7) work packages in SCALE-UP. Starting from the baseline, the thematic cooperation meetings allowed to detect **barriers and challenges** for the **right integration among the horizontal layers and for the implementation of the measures respectively**. The internal assessment of each of the nodes is presented below, each section includes the barriers and potential drivers identified grouped by horizontal layers.

4.1. Antwerp

The city's baseline shows that Flanders's and Belgium's complex mobility landscape can represent an important barrier when it comes to policy making and initiating mobility projects. The Transport Region fails to properly collect data due to unclearly defined competences. Although there is an ongoing discussion on mobility from a citizen's point of view, it is not as strong in all the municipalities of the Transport Region.

Physical

Only two types of potential barriers were identified for the implementation of the measures on the physical layer in Antwerp. The first and most emphasized one is "involvement and communication" related to the coordination of various visions and ideas of the different stakeholders involved in the deployment of the measure. Additionally, the need of raising awareness of the different measures is considered as key to ensure their success. The second type of potential barriers identified is "technical" and as it is related to different technical aspects for the development and implementation of the measures.

New technologies and political aspects such as the ambition of Antwerp to reach climate neutrality by 2050 (governance agreement 2019-2024) are considered potential drivers that might ensure measures 'success.

Digital

From ML's perspective, lack of cooperation and willingness between all stakeholders can represent a barrier for the correct implementation of digital measures and for its interaction with measures of the physical layer. Moreover, technical issues like data availability, standardisation, and operability need extra resources and support.

Finally, legal issues concerning data management are also considered as a possible barrier due to the complications it implies.

On the other hand, European regulation and financial support play a fundamental role for the optimal implementation of digital measures and for ensuring their continuity after SCALE-UP.

Human

Measure leaders consider that setting a common approach for reaching measures' objectives could be hard due to the great variety of stakeholders and the multidisciplinary teams involved. The fact that all the stakeholders are not on the same page, could also cause conflicts when dealing with incentives. Privacy regulation (GDPR) is also considered as a potential barrier due to the difficulties related with managing data, especially citizen's data. Finally, the health crisis due to COVID-19 has caused a negative impact on the organisation of events, delaying the implementation of the measures focused on them.

From the positive side, the existing culture of monitoring events is expected to act as a driver for measures that aim to change citizens behaviour towards active and sustainable mobility.

4.2. **Madrid**

During the last 4 years there has been a 13% increase in public transport use, which is a challenge for existing infrastructure. The high level of emissions, lack of parking space and goods distribution are other challenges that need to be addressed. When it comes to data, a framework for its management (ownership, collection, methodology...) is urgently needed in order to exploit it to its full potential. Other barriers detected in the city's baseline are problems regarding infrastructure for active modes, such as poor pedestrian spaces, bad connectivity, or discontinuous cycling lanes. It was also observed that there is a need to improve communication and awareness to shift citizen's behaviour towards sustainable mobility. presents the barriers and challenges identified in the knowledge exchange webinars.

Physical

Several types of potential barriers were identified for the physical layer in Madrid. One can distinguish between barriers related to stakeholders, citizens, and infrastructure.

The ones related to stakeholders have to do with possible additional technological requirements that might arise during the implementation of the measure and to insufficient cooperation between different administrations and stakeholders especially when trying to scale-up the measures to different administrative levels.

According to the MLs, lack of space and poor infrastructure available might be obstacles to the lean implementation and adoption of the measures. Moreover, cultural issues might represent two different barriers: citizens' opposition to the implementation of different measures and misuse of the facilities deployed as part of the measure. Involvement of all parties and adequate communication also need to be correctly addressed to raise public awareness.

Regarding potential drivers, most of them are related to financial aspects like economic incentives for users or new public-private partnerships derived from the implementation of the measure. Additionally, as most of the measures are part of wider strategic plans at city, regional and national level, their objectives are more likely to be aligned towards clean mobility.

Digital

Two clear potential barriers were identified for the implementation of the digital measures. The first one has to do with involvement and institutional issues. The inadequate communication between the different stakeholders and the slow reaction time of public administration might delay measure's deployment. The second potential barrier deals with technical concerns for the integration of data ensuring certain levels of accuracy.

The availability of real-time information together with new technologies implemented for data acquisition could be considered as potential drivers.

Human

Insufficient communication and low citizen participation cause a lack of awareness of the different services available. This could represent a barrier in the implementation of any mobility measure but even more during its operation phase. Furthermore, cultural issues might be the principal barrier to achieve the expected change in behaviour.

4.3. **Turku**

According to Turku's baseline, one of the main barriers is the lack of a common administrative structure, with decisions being made by local municipalities and not always aligning with the Region's interests. New business models are needed to provide safe, clean, and inclusive mobility. Another challenge identified is the lack of a common owner for mobility-related data. Profiling user segments must advance to better impact citizen's behaviour.

Physical

Funding and lack of economic sustainability are potential barriers identified in Turku for measures included on the physical layer, especially to make them go further than only short-term pilots. Communication needs to be properly addressed to raise awareness of citizens and to overcome cultural difficulties related to the acceptance of the measure. Additionally, positional barriers like the unclear role of the city in the roadmap might affect the scalability and operation of the different measures.

With respect to potential drivers for the implementation of the measures, MLs consider that the work started by the stakeholders in the CIVITAS ECCENTRIC project to improve involvement and communication would serve as good basis for further cooperation. There are cooperation structures established between the region's municipalities and most of the stakeholders work together in several ongoing cities' processes related to mobility.

Digital

Different potential barriers dealing with involvement were identified in the digital layer. Among these, contractual situation, lack of resources and lack of interest might hinder the use of new technologies for data acquisition and management. Other data related issues like ownership, know-how on utilizing and data quality might represent a challenge when dealing with multi-operator information.

The use of open-source code will be used as a technological driver to ensure scalability of the measures. Moreover, the inclusion of the measures into the Service map of the city, is expected to ensure a stable and constant exploitation of them after the project.

Human

New cooperation models need to be created to support nudging campaigns, for this, specific planning on how to come up with viable incentives that have the desired (long-term) impact needed. Identifying different users' groups and defining strategies to reach them based on their needs are evident barriers that might need to be overcome for the correct implementation of the measures. Furthermore, specific problem-related barriers such as winter conditions may affect the measures' deployment.

MLs consider that contextual geopolitical situations and previous work done by the City of Turku in developing climate strategies might support the incentive campaigns included in the measures focused on behaviour change. Existing strategic policies support the measures, and the further involvement of other parties is expected for promoting the winter brand.

5. EXTERNAL ASSESSMENT FROM THE FOCUS GROUPS

The FGD held in each urban node with a wide range of experts allowed to identify **integration challenges** and to gather an **external perspective** on the **measures' planning, implementation and operation**. The specific barriers and challenges found for each node are presented in the following sections grouped according to the intervention area they are related to as in the detailed analysis of the FGD presented in D1.2. Table 1, Table 2, and Table 3 present the barriers and challenges most mentioned by the experts in each node.

5.1. Antwerp

The FG discussion held in Antwerp on May 20th, 2022, brought up economic and environment & planning barriers that were not previously considered by the consortium members. Most of the barriers mentioned belong to Innovation-ICT. Additionally, some of Antwerp's main barriers are related to the lack of coordination, either in relation to urban policies, such as the lack of Transport Region parking policy or the lack of coordination between operators and administrations regarding data collection and usage.

Table 1: External assessment of barriers and challenges in Antwerp

TOPIC	BARRIERS AND/OR CHALLENGES
Regulatory	• Lack of coordination, as seen in lack of Transport Region parking policy • MaaS approach different for each City/Municipality
Economic	• Lack of coordination between operators and administrations in regard to data collection and its administration
Transport	• Freight distribution as a challenge because of its relevance (Port of Antwerp-Bruges)
ICT	• Lack of data related to daily movements/commuting or real time information • MaaS not fully developed, and New Mobility Services (NMS) not integrated • Traffic model just based on cars
Environment and planning	• Outdated urban planning • Data on pollution: cause-effect difficult to evaluate

5.2. **Madrid**

Economic and environment & planning barriers are challenges that were brought up by the external experts in Madrid to complement the internal assessment. Two key economic barriers were identified: the first one is related to the high competition between partners and the second one to the distortion of the market on the mobility service concept. In addition, the challenge of energy transition in the transport sector is considered of major concern by the experts and it was not explicitly discussed by the consortium members. From the experts' perspective, most of the barriers and challenges in Madrid are related to the social agenda and citizens' behaviour and participation.

Table 2: External assessment of barriers and challenges in Madrid

TOPIC	BARRIERS AND/OR CHALLENGES
Regulatory	• Lack of strategy for new actors (players such as NMS providers)
Economic	• High competition between partners • Market distortion on the mobility service concept
Transport	• Regulated offers and fixed frequencies
ICT	• Private electric vehicle contradictions (do we want an increase in private vehicles even if they are EV?)
Environment and planning	• Challenge of energy transition in the transport sector • Lack of consensus on the mobility zone of influence • Underdeveloped urban strategic planning
Social agenda	• Strong mobility habits • Ignorance of MaaS among users • Unidentified cultural patterns • Emotional value of the car • Slow change mobility culture paradigm • Poor citizenship involvement

5.3. **Turku**

Unlike Antwerp and Madrid, the barriers identified in the FG in Turku are linked to the physical layer and the most discussed topics were transport and social agenda (see D1.2, Annex 3). Additionally, environment and planning barriers and challenges such as incomplete cycling routes need special attention according to the external experts.

Table 3: External assessment of barriers and challenges Turku

TOPIC	BARRIERS AND/OR CHALLENGES
Regulatory	• Lack of political willingness to develop PT alternatives due to fear of the public • Slowness of developing plans
Transport	• Piloting P&R facilities: a suitable location was not identified yet
ICT	• Technology is not an immediate solution or a solution for everything
Environment and planning	• Cycling routes end in the middle of nowhere • Urban planning-PT: everything goes through centre, no suburban connections • Good quality street infrastructure and planning is crucial for behavioural change
Social agenda	• Lack of awareness • Policies that do not resonate with individuals' life • Local businesses opposing to pedestrianization • Challenge of educating children: travel time, learning to prioritize cars, safeness

The barriers and challenges presented in *Table 1, Table 2, and Table 3* are node specific, which means that they might be related to the context and to the nodes' characteristics. However, on the three FGDs there were other general and common barriers identified by the external experts. Among them, the most relevant and repeated ones were:

Regulatory:

- Unrealistic/ too optimistic modal split
- Unclear regulation on ownership & privacy issues of sharing data

Economy:

- Lack of service provider figure
- Lack of or poor Public-Private Partnership (PPP) collaboration
- No business model for data provision & analysis

Transport:

- Car ownership/dependency
- Excessive travel time in public transport
- Challenge of transferring infrastructure from cars to active modes and/or Transforming infrastructure
- Poor accessibility and lack of connectivity
- Poor multimodality - especially in metropolitan areas

ICT:

- MaaS not fully developed, and NMS not integrated
- No single data repository
- Lack of integrated strategy for data collection, provision and sharing services

Environment and planning:

- Urban sprawl

Social agenda

- Lack of citizen engagement

6. LESSONS LEARNED ON WHAT TO AVOID-SHIFT-IMPROVE (ASI)

The internal and external assessment together with the baseline of each node allowed to have a clear diagnosis of the urban nodes in terms of planning, implementation, and cooperation. It helped to identify barriers and challenges that must be faced for the deployment of the different mobility measures and possible drivers to enable their replication in other urban nodes.

All inputs were grouped in line with the Avoid-Shift-Improve (ASI) methodology for each of the six topics considered after the analysis of the FG discussions in D1.2. The ASI approach was initially developed in the early 1990s in Germany and first officially mentioned in 1994 in the report of the German Parliament's Enquete Commission[13]. The approach serves to structure policy measures to reduce the environmental impact of transport and improve the quality of life in cities.

Regulatory

Regarding regulatory issues, there is a clear need of improvement in the speed of the Public Administration avoiding complicated and unnecessary bureaucracy. With respect to the digital layer and data usage and management, it is necessary to avoid unclear regulation on data ownership, privacy issues and data sharing to ensure the proper use of the available data. Moreover, experts consider that to achieve the desired change in mobility behaviour, it is essential to shift to a bottom to top approach which might be supported with the regulations needed.

Figure 2 presents the most relevant findings regulatory-related obtained from the three-dimensional assessment of the three SCALE-UP nodes.

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[13] Bongardt, D., Stiller, L., Swart, A., & Wagner, A. (2019). Sustainable Urban Transport: Avoid-Shift-Improve (ASI). Transformative Urban Mobility Initiative.

Regulatory

AVOID
- Contradictory parking measures
- Unclear regulation on data protection
- Unclear regulation on ownership and privacy issues of data sharing
- Complicated bureaucracy

SHIFT
- Perceived uncertainty on data ownership
- From unrealistic/too optimistic modal splits to a more realistic one
- Multilevel and multi spatial urban strategic planning
- To a bottom to top approach, affecting end-user´s behaviour
- To a transversal understanding of the mobility concept (in theory and practice)

IMPROVE
- The speed of developing plans
- The number of resources made available to small municipalities for data related issues
- Local authorities support to NMS
- The speed of the Public Administration
- Vision alignment at different administrative levels

Figure 2: Regulatory-related findings on what to avoid-shift-improve

Economic

The improvements proposed in the economy field are related to PPP collaborations, data management and to the standardization of economic incentives for citizens (including the definition of the entity which will assume the costs of the incentives).

In line with the PPP collaborations, experts agree on the need to avoid unstable synergies between stakeholders, market distortion on mobility services and non-mobility-oriented agenda.

Figure 3 presents all the inputs obtained on what to avoid-shift-improve regarding economic aspects including the perspectives of SCALE-UP members and of external experts in the three nodes.

Economic	
AVOID	- Market distortion on mobility services concept - Private companies´ power and non-mobility-oriented agenda - Not having a business model for data provision and analysis - Misinformation - Unstable synergies between stakeholders
SHIFT	- To start-up businesses approach that is closer to end user´s needs
IMPROVE	- PPP collaboration - Services by creating a service provider figure - Data management by business creating data input and release - Standardization of incentives and study who will assume the cost of the incentives

Figure 3: Economic-related findings on what to avoid-shift-improve

Transport

As transport is implicitly included in most of the topics, there are fewer transport specific barriers and challenges identified. All the issues that need to be improve are related to accessibility, connectivity, and multimodality, with a special focus on public transport (PT). To foster the use of PT there is a clear need of shifting people's mindset from being used to the car to reduce car ownership and car dependency. As the goal is to reduce cars, it is important to avoid the use of shared EV to replace public transport, keeping in mind that EV cause congestion, accidentality and need the same space as combustion engine vehicles, despite their lower negative impacts on the environment.

Figure 4: Transport-related findings on what to avoid-shift-improve

ICT

Regarding information and communication technologies there are three main common concerns (Figure 5):

- **Data.** It is necessary to shift to an integrated strategy for data collection, provision and sharing. Moreover, data availability and reliability need to be improved to be able to propose data-driven mobility solutions. In some cases, the know-how of ICT/data needs to be improved among local authorities to avoid the incorrect use of data.
- **PT-centred approach.** A shift to a PT-centred approach is essential, always focusing on users' needs.
- **MaaS.** The development and unification of mobility-as-a-service (MaaS) is seen as both, a challenge due to the differences between stakeholders and as a driver that could promote citizens' change in behaviour towards more sustainable decisions.

ICT

AVOID	- Incorrect use of data
SHIFT	- To a PT centred approach - To more user-friendly interfaces - To an integrated strategy for data collection, provision and sharing services
IMPROVE	- MaaS development and unification - Integration of NMS - Data availability and reliability - Know-how of ICT/data among local authorities - E-vehicles solutions (charging stations, information on charging points) - Data-driven solutions

Figure 5: ICT-related findings on what to avoid-shift-improve

Environment and planning

Urban sprawl needs to be avoided due to the negative impacts it has in mobility. Current urban design and planning should shift to a sustainability focus approach, with infrastructure that fosters and eases active mobility. Additionally, communication campaigns with adequate messages are needed to improve the perception and understanding of pedestrianization as benefits for health and for local businesses.

Environment and Planning

AVOID	- Urban sprawl
SHIFT	- Urban design and planning´s focus to sustainability - Current PT discourse to health oriented and comfort one - Street infrastructure and planning to one that fosters a change in behaviour
IMPROVE	- Planning with a land use-public space – P&R analysis - And update urban and environmental planning - The connection between green spaces to impact habits and health - The perception and understanding of pedestrianization as benefiting for local business

Figure 6. Environment and planning findings on what to avoid-shift-improve

SCALE-UP | [D1.5 Guidelines & recommendations for other cities on SCALE-UP strategies for vertical & horizontal upscaling 1]

Social agenda

Social agenda is clearly a concern among SCALE-UP partners and experts external of the project. Citizen involvement needs to be improved to gather people's perception, expectations and to raise their awareness on the benefits of the different measures, boosting the user-centric approach. A shift in the emotional value of the car and active modes is needed towards more sustainable habits.

Social Agenda
AVOID
- Poor communication methods and strategies
- Lack of awareness from policy makers that ends in policies that don´t resonate with individuals´ everyday life
SHIFT
- Shift strong everyday habits
- The attitude to PT by getting children used to it and active modes
- The emotional value of the car to PT and active modes
- The importance time has in our lives to a conception of it that encourages the use of other modes
IMPROVE
- Awareness
- Speed of change of the mobility culture paradigm
- PT perception and reputation
- Education and training in respecting "shared facilities"
- Citizen involvement
- Digital skills and resources
- Communication of actions, measures, and changes
- Knowledge and gathering of people´s perception, expectations, opinions
- And promote knowledge by recurring to travel behaviour surveys carried out in person

Figure 7: Social agenda findings on what to avoid-shift-improve

7. GENERAL GUIDELINES & RECOMMENDATIONS

The diagnosis of the current situation in the three SCALE-UP nodes and three-dimensional assessment of barriers, challenges, and drivers for the implementation of different mobility measures and for the correct integration of the different layers of the mobility system were the inputs used to develop the following guidelines and policy recommendations. These aim to serve SCALE-UP and other urban nodes to optimize different mobility measures and strategies. Additionally, these guidelines and recommendations are expected to maximise the efficiency in the learning processes in urban nodes in relation to the vertical and horizontal integration.

The proposed policies were grouped in four wider and general groups aligned with the four layers of SCALE-UP: (1) Regulations and legislation (Governance), (2) Car independent lifestyles (Physical), (3) Smart and connected mobility (Digital) and (4) Behavioural change (Human).

A brief description of the most relevant recommendations was included in each group including findings of previous research related to the field. Additionally, a summary table with six different columns presents the following information:

1. **Intervention type/area.** Describes the type and/or area of intervention proposed. The interventions were selected based on the combination of different measures and policy instruments that were brought up in the first stage of SCALE-UP and were successful in previous projects.
2. **Intervention approach.** The interventions were classified according to the Push and Pull approach (Bongardt et al., 2011); also known as Push and Pull effect (Dijk et al., 2018):
   - **Push policies** are the ones that "push" travellers away. For example, to reduce car use, the implementation of Low Emissions Zones (LEZ) or higher parking tariffs.
   - **Pull policies** are the ones that "pull" travellers to car alternatives like monetary incentives, improvement of public transport, improvement of walking and biking infrastructure.
3. **Policy instruments.** The policy instruments were classified using one of four Intergovernmental Panel on Climate Change (IPCC) classification of subnational policies: regulatory instruments, economic instruments, information policies, and public goods & services. As in Kuss & Nicholas, (2022), the instrument "information policies" was expanded to "information & education policies".

4. **Main measures.** Different measures that were effective in other European cities and in SCALE-UP nodes are presented. As the effectiveness of SCALE-UP measures cannot be assessed in this stage of the project, this D1.5 only includes results from previous projects while the project's findings will be included in D1.10 "Guidelines and recommendations for other cities/urban areas on the SCALE-UP strategies for vertical and horizontal upscaling 2".

5. **Stakeholders involved.** The stakeholders involved in each of the intervention were categorized following the approach of Castán Broto & Bulkeley, (2013) and Bulkeley & Castán Broto, (2013) who identified five types of stakeholders involved in urban mobility: National government, regional government, local government, civil society, and private sector.

6. **Integration required.** The definition of the layers needed in the intervention were defined, since its relationship and integration might compromise its success.

7.1. Governance: Integration actions for scaling up local policies to wider areas

From the diagnosis of the three cities in SCALE-UP it was observed that all of them experience challenges in defining the regional and local scope of their mobility policies having different maturity levels and approaches towards cooperation. There are clear institutional and organizational barriers for scaling up local mobility policies to a wider area, or to the Functional Urban Area. Based on the framework for the development and implementation of effective strategies for vertical upscaling presented in D1.1, the following stepwise approach is proposed:

- **Define the FUA**, as a background to develop aligned local and FUA policies.
- **Align the transport region and local policies to the flows of goods and passengers in the FUA**, with a serious consideration of balancing the scale of the FUA and the optimal size when implementation and governance is regarded. The transport region should not be too large, risking implementation inertia, or too small with the risk of not-aligning the local with regional policies.
- The scale for implementation should be focused on **creating heterogeneity** in the FUA, knowledge sharing, position forming towards the regional and national levels.
- All transport regions **should regard the TEN-T** and urban nodes therein as a chance to develop the local-regional-national-EU approach towards mobility, and a chance to develop approaches locally that align with EU objectives and policy approaches, including funding.

7.2. Physical layer: Car-independent lifestyles

One of the main concerns of both, SCALE-UP members and external experts is on how to foster and achieve a shift from car to active mobility. Using SCALE-UP's strategies and experiences from previous projects, four different approaches are presented including recommendations and guidelines for other cities and urban nodes.

According to UN Habitat (2021)[14] cities are responsible for 50-60% of global greenhouse gas emissions. Recent studies have showed that reducing the number of cars on the road has a high potential to lower emissions per person (Ivanova et al., 2020). Moreover, the reduction of car use in cities is especially important to promote equity amidst limited urban space, as car users take 3.5 times more physical space than non-car users (Creutzig et al., 2020). The following paragraphs present recommendations gathered from SCALE-UP partners and external experts to foster the shift to car independent lifestyles.

7.2.1. Raise awareness on the real cost of car ownership

The car is one of the most expensive household consumer goods, yet there is a limited understanding of its private (internal) and social (external) cost per vehicle-km, per year or lifetime of driving. (Gössling et al., 2022) estimated the full costs of owning and operating typical cars in Germany, concluding that most lower-income and many moderate-income households are harmed overall by policies that favour automobile travel over more affordable and resource-efficient modes. Those policies force many households to own more vehicles that they can afford imposing large external costs especially on people who rely on walking, cycling and public transport. Additionally, in a previous study, Gössling et al., (2019) estimated the social cost of automobility, cycling and walking in the European Union. Their results showed that the external cost of automobility in EU is about €500 billion per year, while cycling and walking represent benefits of €24 billion and €66 billion respectively.

These figures support the urgent need to raise awareness on people among the real cost of car ownership, that implies not only economic but health and social issues. For this, it is necessary to clearly identify the target groups where to focus the efforts

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[14] United Nations (2021). United Nations Habitat Annual Report. *UN Habitat,*
https://unhabitat.org/sites/default/files/2021/05/annual_progress_report_2020_final.pdf

and use the most adequate communication campaigns to ensure that the message is clearly transmitted to the target audience.

Integration required: Awareness of the real cost of car ownership is a common interest at different levels. It is not only necessary to achieve a certain level of consciousness among citizens but to give them options to be able to make sustainable responsible decisions. For this the adequate integration of mobility measures of the physical and human layers is needed. A clear example in SCALE-UP are the measures fostering multimodality and active mobility (multimodal hubs, bike sharing systems) whose success might depend on the communication campaigns and the incentives belonging to the human layer. Additionally, governance issues like legislation to support the measures have to go hand in hand with the other two layers to ensures the success of any intervention.

7.2.2. Charges for cars in defined charging zones / private vehicle access limitations/restrictions

Car pricing-limitations-restrictions measures were a common recommendation that came out in the FGDs held in the three urban nodes. There are several terms and variations on the concept: auto-restricted zones, city centre access control, cordon pricing, cordon tolls, area licensing schemes, congestion charge zones, congestion pricing, urban pricing, and traffic-limited zones like the pedestrianization part of SCALE-UP. Some of these interventions have already been implemented in different European cities like the congestion charging zone with a cordon-based system of Gothenburg (Börjesson & Kristoffersson, 2015), London (Metz, 2018) Milan (Beria, 2016), and Stockholm (Eliasson, n.d.) and have shown to have a positive impact. Other interventions like the limited traffic zones introduced in Rome in 2001 (CIVITAS, 2013) could also serve as example.

Integration required: All the alternatives can be used at different scales and be replicated. The main limitation for scalability is related to governance and competences issues. To be able to upscale it, there is a great need of collaborative relationship among the different administrative levels. Additionally, strong political and public opposition might be expected when trying to replicate it. The implementation of any of these measures like the pedestrianization considered in SCALE-UP requires the integration of different governance aspects like political will with physical measures such as the provision of other alternatives to car use such as improved PT.

7.2.3. Change of use of car infrastructure

Both, SCALE-UP partners, and external experts agreed that there is no need to construct new infrastructure to foster active modes but to change the use of the existing infrastructure. Taking the streets back for people instead of cars was also a common concern in the three cities. Forkes & Sztabinski, (2010), assessed the possibility of converting on-street parking to active transport in Toronto considering neighbours and local business perceptions. Contrary to a priori expectations, local business considered that the intervention would not represent changes in their number of daily customers. A progressive change of use of the existing infrastructure is considered feasible since it does not need high investments.

Integration required: These measures can be implemented at any level with low budget. The main requirement is political will (governance) and an adequate level of awareness among citizens (human) of the advantages that the change might represent in their life quality. Participative processes should be considered to gather citizens needs and perspectives to define where and how the change is going to be made. Depending on the results and from the lessons learned, the best practices could be transferred to other cities.

7.2.4. Public transport as the easiest choice

The public transport system must be easy and convenient to use, fast, safe, clean, and affordable. The goal must be to have a system that integrates multiple technologies and different modes. A common ticket or fare card that makes it easy for passengers to transfer from one mode to other was proved to increase the number of PT users. Additionally, *passenger information systems* that enable users to know when the next service is due and to understand the routes easily were proved to have significant influence in users' satisfaction with PT services (Vanderschuren, M., & de Vries, D. 2013, October). PT incentives were also brought as a driver to leave cars behind, however, specific planning on how to come up with viable incentives that have the desired (long-term) impact is still needed, additionally, new cooperation models need to be created to support these incentives. Finally, special emphasis was placed on "providing choices in line with citizens' personal situations" always keeping the user centric approach to achieve a real change in behaviour.

Integration required: *An attractive and competitive public transport system requires the combination of the technology and data available from the digital layer with infrastructure (physical) supply needed to satisfy users' needs.*

Table 4 presents different interventions as best practices from previous projects (it will be updated in the next version of this deliverable with SCALE-UP's results), including the policy instruments required, different measures with a similar goal and the layers needed to ensure its success.

Table 4: Physical layer: Car-independent lifestyles

1. Intervention type	2. Intervention approach	3. Policy instrument(s)	4. Main measures	5. Stakeholders involved	6. Integration of layers required
Charging & Pricing	Push	Information & education policies Economic	Raise awareness on the real cost of the private vehicle Charges for cars in defined charging zones	Local government Civil society	Human + Physical
Access-limitations	Push & Pull	Regulatory	LEZ implementation Access only with especial entrance permit for residents Time-and weekday dependent restrictions Access restrictions based on pollution levels Pedestrianization of congested streets	Local government Civil society	Physical + Digital
Parking & Traffic Control	Push & Pull	Public goods & services Regulatory	Change of use of parking spots P&R as an attractive alternative Include shared mobility in parking rules	Local and Regional government	Governance + Physical
Public transport services	Pull	Public goods & services Regulatory	PT incentives PT as the easiest choice (revenues for public transport expansion)	National, Regional and Local government	Physical + Digital

7.3. **Digital: Data-driven solutions towards connected mobility**

Digitalisation has not touched all industrial sectors in Member States and EU Regions equally. According to European Commission data for 2017, transport had a modest index of digital intensity lower than 15%[15]. This was supported by the main observations from SCALE-UP diagnosis which stated that knowledge on data still proves challenging in some of the cities, with lack of know-how with data among local authorities and data reliability considered as barriers. Regarding data collection and storage, the lack of a single repository for data is considered an important barrier while availability of data is seen as a driver. The data driven approach was proved to be a challenge for public authorities while it is thought a driver for businesses. Different recommendations related to data (collection, management, use and policy), PT centred approach and the MaaS approach were raised by different consortium partners and external experts:

7.3.1. Data

Data policy

Data policy was a clear concern, experts consider there is an urgent need to make a clear data policy that includes a top-down regulation for public governance of data. This regulation should include a distinction between governance of data and governance of data application.

Data observatory

The creation of a mobility observatory "an organization that acts as a repository and even proposes measures or criteria to make decisions based on data" was proposed by external experts. This body could be a good example of public-private partnerships, combining the public recollection of data with the private management of it. This repository could be implemented as a service you can charge for making it self-financing and allowing it to reinvest in technology in order optimize the management and usage of data.

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[15] https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/635528/EPRS_BRI(2019)635528_EN.pdf.

SCALE-UP | [D1.5 Guidelines & recommendations for other cities on SCALE-UP strategies for vertical & horizontal upscaling 1]

This observatory could be the guide for authorities, operators, and citizens on how data should be collected, stored, transferred, and shared. Standardization issues should also be under the responsibility of this entity, which should first analyse the status of data available (governing bodies and operators) to propose applicable general guidelines.

A fundamental function of this observatory would be to gather data, from various sources in various forms to make it interoperable so this data is then turned into potential intelligence (actionable information) to aid in decision making.

Data privacy

The existing GDPR still renders Big Data use and analysis impossible since some stakeholders have no clear understanding of the use or non-use per case of specific data. For this, guidelines and assistance should be provided to service operators and public administration workers.

Integration required: For the data policy the integration of governance (legislation) and digital (requirements for data collection, management, and usage) is needed.

The creation of a data observatory or an authority to manage mobility data is more complex, it requires the integration of the legislation (governance) to provide this entity with the competences needed, the involvement of data experts (human) who control the know-how, the digital technologies for its right functioning and the provision of services (physical).

7.3.2. Deployment of Mobility as a Service (MaaS)

Mobility as a Service (MaaS) is a term used to describe digital transport service platforms that enable users to access, pay for, and get real-time information on a range of public and private transport options. It is considered a key driver to foster the shift towards sustainable mobility since it allows citizens to make journeys more convenient through streamlining planning and payment.

According to the different experts, for its adequate deployment it is necessary to develop a governance model for MaaS and the creation of a mobility agency should also be considered to act as a mediator that fosters partnerships and collaborations among the different stakeholders involved (mainly service providers).

As MaaS data and payment application programming interfaces (APIs) need to be standardised, there should be specific subsidy and investment programs to support its correct deployment. Local authorities need to facilitate and support the "new"

sector in making connections and leveraging access to finance and other resources. In addition, the different administrative levels should promote a joint and aligned framework to achieve a successful and fully integrated MaaS implementation.

In most cases there are still some gaps to close to achieve an optimum MaaS:

- Clear legislation on data ownership, usage, service pricing, etc.
- Alignment of the new MaaS businesses decisions with the government goals or strategies.
- Ensure inclusiveness and accessibility of the MaaS platform to all customers from the outset.
- Local authorities should develop their MaaS platforms based on local solutions aligned with national agreed standards.

Integration required: *While there is a high transferability potential for MaaS, its success might be conditioned to: lowering institutional barriers for its implementation (governance), assisting the development of viable and sustainable business models, pushing the diffusion and availability of the services (physical) and to accelerating its use and adoption through adequate communication (human).*

Table 5: Digital layer: Data-driven solutions towards connected mobility

1. Intervention type	2.Intervention approach	3.Policy instrument (s)	4. Main measures	5. Stakeholders involved	6. Integration of layers required
Regulatory	Pull & Push	Regulatory	Mobility data strategy Development of legislation for data collection, management, usage	National, Regional and Local governments	Governance+ Physical + Digital
Technology development	Pull	Public goods & services	Mobility data tool Mobility portal Real time mobility data platform	Local governments & Private sector	Physical + Digital
Regulatory	Pull	Regulatory	MaaS governance model	National, Regional and Local governments	Governance + Digital + Physical
Technology development	Pull	Public goods & services Information & education policies	MaaS Campaigns to foster MaaS usage	Local governments, Private sector & civil society	Digital + Physical Digital + Human

7.4. **Human: User-centric perspective for effective behavioural change**

The common goal of any intervention is to promote sustainable travel and to reduce car use by changing travellers' attitudes and behaviour. Typically, it involves either "hard" measures like new footpaths or bike lanes or "soft" measures like information and communication campaigns. The different recommendations related to fostering behavioural change towards sustainable mobility are related to three different intervention areas: (1) Citizen participation and engagement, (2) Effective communication campaigns and (3) Customer centric approach

7.4.1. Fostering citizens' participation and engagement

There is a common consensus that citizens play a critical role in the success or failure of any mobility measure. It was agreed that there is an urgent need to increase citizens participation in decision making. Irvin & Stansbury (2004) have showed that fostering citizens participation not only represents advantages for the government like gaining legitimacy in their decisions but for the citizens themselves by gaining some control over the policy process.

Among the different instruments used for citizens participation, surveys are found to be essential to find their mobility preferences which a key element to foster a change in their behaviour. Other activities like mobility "round tables" were also brought up as ideas to foster participation.

In SCALE-UP there are no measures specifically focused on improving citizens participation in decision making processes. However, there are measures specifically linked to communication campaigns.

Integration required: To foster citizens participation in decision making processes the combination of political will (interest in citizens' needs, allocation of budget for participation activities) (governance) with citizens commitment, civility, and interest to become part of the decisions (human) are key.

7.4.2. Communication

Several recommendations mentioned are related to the communication campaigns. The first one **was to identify the key elements that contributed to the** success of previous campaigns, it is essential to learn from the past and improve for the future. Previous studies showed that campaigns are more successful when combined with other actions like enforcement, legislation, incentives and mainly education. Additionally, the chance of success of the campaigns increases when they have a theoretical model, when they address a specific target audience and when that target audience is adequately segmented (Delhomme et al., 2009).

SCALE-UP and external experts considered that the communication campaigns should be focused on the individual following the user centric approach. For this, the target group needs to be clearly identified with a specific audience defined. Additionally, the group should be segmented in order to reach the whole target group and to address members of the audience as effectively as possible.

It was also stated that the campaigns must have clear and realistic objectives and should be aligned with city strategies. Taking into account political, cultural and economic context.

Finally, it was recommended to choose one single theme rather than multiple themes and relay on social marketing to find the correct channels of communication. For all this, stakeholders should be involved and committed.

Integration required: Legislation and incentives depending on governance are needed to support any measure that fosters behavioural change towards active mobility. Additionally, the budget allocated to communication campaigns also depends on governments' approval. The different digital tools of the mobility layer are expected to serve as communication channels to connect with the citizens (human).

7.4.3. User-centric approach

Following the user centric approach, the use of the "customer corridor" was mentioned as a driver to promote change. For both, policy makers and service providers identifying the "customer corridor" is a way to see mobility services from the citizen (customer) perspective. It helps to see what is important and what is not. Properly done, it helps to identify areas where changes can be made at both the transactional and strategic, i.e., relationship levels. The objective would be to understand citizens' needs and collect insights of their end-to-end experience with the different mobility services.

*Integration required: The user centric approach requires political willingness (governance) for understanding citizens' needs, collecting insights and developing policies in accordance. For this, the participation of citizens through citizen platforms, forums, or communication activities is essential. The infrastructure deployment and the services offered (physical) need to be adapted to the demand which should be estimated based on real data obtained from the different measures of the **digital** layer such as the deployment of mobility portals or the implementation of a mobility data observatory. The data obtained from the digital layer would also serve to understand nudge and citizens' behaviour. As seen, the user centric approach to promote active modes and sustainable mobility requires and optimum integration of the 3 horizontal layers of the mobility system and its interaction with governance.*

Table 6: Human layer: User-centric perspective for effective behavioural change

1. Intervention type	2.Intervention approach	3.Policy instrument (s)	4. Main measures	5. Stakeholders involved	6. Integration of layers required
Participative processes	Pull	Information & education policies	Improvement of citizens participation in decision making processes	Local government, civil society	Governance + human
Socialization campaigns	Push + Pull	Information & education policies	Communication campaigns combined with legislation	Local government, civil society, private sector	Governance + digital + human
Economic incentives	Pull	Economic	Incentives	Local government, civil society, private sector	Governance + physical

8. CONCLUSIONS

This document was prepared to offer guidelines and recommendations to the SCALE-UP nodes and other cities for the implementation of mobility measures and the integration of mobility strategies considering mainly aspects coming from the diagnosis of the current situation.

Multi-level governance (Extracted from D1.1)

There are clear institutional and organizational barriers for scaling up local mobility policies to a wider area, or to the Functional Urban Area. Institutional competition and strong asymmetry (institutional, organizational) at the regional level severely hampers the possibilities for intermunicipal joint planning and actions.

The awareness of stakeholders for the FUA level is low; public transport is mainly dealt with at the level of the Region. It is therefore advised to define cooperation on the right geographical level, based on a balanced assessment and approach that takes account of the regional scale of transport flows (the FUA), without forgetting about the clear advantage of heterogeneity between the FUA´s participating communities. The FUA is best helped with a good cooperation between the partners developing joint supported policies in the region and locally, without forgetting that the FUA can also make ad-hoc relations with partners operation at the FUA or beyond (e.g., National Railways). The FUA´s could take a joint position and use their strength in steering regional and National stakeholders. Madrid can take advantage of the setup of the ATR in Antwerp and the development of the policies in the Turku region. Antwerp and Turku can learn from the regional SUMP ambitions of Madrid.

One can follow this stepwise approach:

- **Define the FUA**, as a background to develop aligned local and transport region policies.
- **Align the transport region and local policies to the flows of goods and passengers in the FUA**, with a serious consideration of balancing the scale of the FUA and the optimal size when implementation and governance is regarded. The transport region should not be too large, risking implementation inertia, or too small with the risk of not-aligning the local with regional policies.
- The scale for implementation should be focused on **creating heterogeneity** in the transport region, knowledge sharing, position forming towards the regional and national levels.

- All transport regions **should regard the TEN-T** and as a chance to develop the local-regional-national-EU approach towards mobility, and a chance to develop approaches locally that align with EU objectives and policy approaches, including funding.

Horizontal integration

The diagnosis of the nodes served to identify different barriers for the implementation of the measures as for the integration among the different layers of the mobility system. Some of them might depend on the context of the node while other seem to be common among them. It was observed that none of the layers can work by itself, but its interaction and integration are key to ensure the success of mobility strategies. The findings on what to avoid-shift-improve per horizontal layer are presented in Chapter 6 and general recommendations for each layer and the integration required are included in Chapter 7. Based on them, the following general recommendations were drawn:

- The objectives of the different stakeholders and administrations need to be aligned to ensure that all resources available (human, economic, etc) are allocated with the same end.
- It is essential to ensure cooperation between stakeholders, good relationships between them can facilitate information exchange and reduce deployment and implementation time. For this, it is necessary to establish communication mechanism among stakeholders and raise awareness on all of them on their existence and the importance of using them.
- In every intervention, the role and competences of each stakeholder needs to be clear since the planning stage. Stakeholders need to have a clear understanding of their rights and obligations. The competences and responsibilities need to be legally and contractually backed.
- Regulation and legislation need to be updated and must be considered in the planning stage of every intervention avoiding gaps that might compromise the achievement of objectives. It needs to serve as a tool to facilitate interaction among layers rather than a barrier.
- There is a clear need to develop a framework or strategy to deal with data, including data collection, data management and data usage. Different approaches were brought up as the creation of a data observatory or a mobility data platform. This figure not only would oversee managing data but could also be in charge of developing and keeping updated the guidelines needed to ensure that data collected meets minimum quality standards and that it is properly handled.

- Specially attention should be taken to data regulation, not only on collection and management but on data usage.
- The assessment of long-term financial sustainability is key for every strategy. It should be considered since the planning stage to make them go further than short-term pilots.

SCALE-UP | [D1.5 Guidelines & recommendations for other cities on SCALE-UP strategies for vertical & horizontal upscaling 1]

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