

D5.3 Lessons learned and solution portfolio of clean and safe mobility solutions, strategies demonstrated in the urban nodes

Disclaimer

This project has received funding by the European Union's Horizon 2020 research and innovation programme under grant agreement number 955332.

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D5.3 – Lessons learned and solution portfolio of clean and safe mobility solutions, strategies demonstrated in the urban nodes

WP No.	5	WP Title	Clean, safe and inclusive mobility solutions
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Due Date		31.03.2025	
Delivery Date		27.03.2025	

Version history

Version	Date	Summary of changes
0.1	25.02.2025	First version of the document
0.2	12.03.2025	Version ready for peer-review
0.3	24.03.2025	Version ready for peer-review
0.4	27.03.2025	Final version



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1. Executive Summary

SCALE-UP (Scale Up User-Centric and Data-Driven Solutions for Connected Urban Poles) is a four-year Horizon 2020 Innovation Action that brings together 23 partners across five European countries. Its primary objective is to develop data-driven and user-centric strategies to accelerate the take-up of smart, clean, and inclusive mobility. Three advanced urban nodes: Antwerp, Madrid, and Turku serve as living laboratories for interconnected measures aligned with EU climate and transport objectives.

Within SCALE-UP, Work Package 5 (WP5) focuses on clean, safe, and inclusive mobility solutions. Following the experiences and outcomes documented in Deliverable 5.2 – *Final Report on Implementation of accessible and affordable innovative clean and safe mobility solutions* (D5.2), this Deliverable 5.3 – *Lessons learned and solution portfolio of clean and safe mobility solutions, strategies demonstrated in the urban nodes* (D5.3) compiles the lessons learned and presents a solution portfolio for potential replication.

- **Framework for Clean Transport Strategies:** D5.3 sets out principles and recommendations for designing, governing, and operating clean and safe mobility solutions. It builds on tangible insights from the three urban nodes.
- **Data-Driven Approach:** By leveraging real-time analytics and continuous performance monitoring, the project has demonstrated how evidence-based adjustments can optimize resource allocation, improve user satisfaction, and strengthen road safety.
- **Lessons in Stakeholder Collaboration:** The experiences in Antwerp, Madrid, and Turku underscore the importance of public-private partnerships, joint decision-making, and sustained community engagement to ensure long-term sustainability.

D5.3 aims to support other cities and regions in replicating and adapting the SCALE-UP approach. Ultimately, the project's collective experiences encourage local authorities, operators, and communities to collaborate in shaping smart, clean, and inclusive urban mobility, paving the way for a more resilient and sustainable future.



2. Introduction

2.1. Purpose and Context of the Document

This document collects the insights and findings gathered under WP5 of SCALE-UP. Following the demonstrations presented in D5.2, the current deliverable compiles the lessons learned and formulates practical recommendations for cities and regions aiming to implement clean, safe, and inclusive mobility solutions. By synthesizing real-world experiences from Antwerp, Madrid, and Turku, it provides an evidence-based framework that can guide further initiatives targeting decarbonization, road safety, and accessibility in urban contexts.

As part of WP5 addresses Clean, Safe, and Inclusive Mobility Solutions within SCALE-UP, Task 5.5 (T5.5) specifically focuses on consolidating and analysing the solutions deployed in the urban nodes, assessing their effectiveness and scalability. This deliverable directly correlates with D5.2 and D7.8, offering a structured reflection on what worked, where challenges arose, and how similar interventions might be replicated or adapted elsewhere.

2.2. How to Use This Guide

The structure of this deliverable is designed to take readers from the broader context: what measures have been implemented in the Urban Nodes, and their first results; to in-depth recommendations covering hub design, operations, data integration, and user experience. Ultimately, the goal of this document is to enable other cities (of varying scales and geographies) to replicate and adapt the solutions (or part of them) demonstrated in the three SCALE-UP urban nodes.

Annex 1 define the main concepts considered in this report to help external readers to the SCALE-UP project.

3. Clean, Safe, and Inclusive Mobility Solutions within SCALE-UP

In the context of SCALE-UP, clean and safe mobility solutions are strategies and interventions aimed at mitigating environmental impacts, enhancing safety, and promoting equitable access within urban transport systems. These solutions seek to:



- Lower Carbon Footprints: Through measures such as integrating renewable energy sources, electrifying vehicle fleets, and encouraging active travel modes.
- Improve Road Safety: By optimizing routing for freight, building protected infrastructure for cyclists and pedestrians, and deploying real-time monitoring systems to reduce collision risks.
- Foster Social Inclusion: Ensuring that all citizens (regardless of income, age, or physical ability) can benefit from mobility services that are accessible, affordable, and reliable.

Taken collectively, these solutions form a holistic approach to addressing the multifaceted challenges that modern cities face, especially regarding air quality, traffic congestion, and equitable transportation.

As part of SCALE-UP, WP5 focuses specifically on demonstrable clean and safe mobility measures in Antwerp, Madrid, and Turku. The urban nodes, acting as demonstrators, have implemented:

- Renewable Energy Deployments for transport infrastructure, ensuring greener power sources for shared mobility or logistics solutions.
- Shared E-Mobility Services that bridge first- and last-mile gaps, often coupled with incentives to encourage modal shifts away from private cars.
- Data-Driven Freight Management tools that reduce conflict points between heavy vehicles and vulnerable road users by strategic route planning.

These measures have been tailored to address local challenges (ranging from port-related freight flows to dense metropolitan traffic) yet are guided by a common principle: creating a more sustainable, equitable, and user-centric mobility network. By examining WP5 measures as a cohesive set, cities gain a practical template for scaling, replicating, or customizing interventions in different contexts.

3.1. Overview of Antwerp measures

3.1.1. Measure A6

Measure A6, the Ring Road as a highway for green energy, aims to produce all the energy needed for the new Ring Road infrastructure, so that it does not contribute to extra CO₂ emissions.

The new Ring Road, which is situated around the city, allows a better distribution of the traffic, but it is also used for implementing heat pipes or reservation lanes for the



city-wide district heating network from the port. The combination of these issues contributes to a climate neutrality in Antwerp.

Although reaching to relevant results was quite difficult, the heat pipes for the district were implemented in two district and the reservation lanes in another one, were implemented in the designs.

3.1.2.Measure A7

The goal was to implement a single bike sharing system for the entire Antwerp Transport Region that was accessible to everyone, including commuters, students, and tourists. To do so, public and private cooperation was needed between the ATR, Donkey Republic and all municipalities of the ATR, in order to disseminate the sharing system, and to set the locations of the hubs.

The aim of the hubs was to boost the use of the bike sharing system by increasing the likelihood of finding bikes in a short distance. In addition, also drop-off hubs were created.

To facilitate the use of the bike system and also to combine this sustainable mode with other modes of transport, the e-bike system was integrated into the "Smart Ways to Antwerp" app. When planning a journey, a Donkey bike was offered as an option too.

This measure was well received by the people and the use of shared e-bikes increased considerably in rentals.

3.1.3.Measure A8

Measure A8 consist of developing a freight route planner, that aims to provide truck drivers with safer routes for their last miles in urban areas. To increase the safety in the logistic ecosystem and therefore in the citizens, the trucks were guided by the tool mainly to the high category roads avoiding pedestrian areas, school areas and limited traffic zones. The main idea was to minimize critical situations that put in risk vulnerable road users.

Same than in measure A7, stakeholders' cooperation was a key point to develop the win-win tool: to develop the API, the City of Antwerp and Antwerp Transport Region provided Be-Mobile with the required data sets and policy requirements from the city and the region.



This measure has a direct link with the digital pillar due to the relevance of the datasets to feed the tool to better manage the urban logistics, increasing safety in the citizens and reducing the pollution and noise.

After testing the route planner, the city decided to integrate the info in the existing route planner of Smart ways to Antwerp.

3.2. Overview of Madrid measures

3.2.1. Measure M5

Madrid focused on improving the shared e-mobility fleet of electric bikes by implementing 3 actions:

- Creation of a portable electric bike docking station with its own power source by using photovoltaic panels or other battery solutions. The mobile station allows Bicimad to better adapt the demand and the offer to the real needs whenever any local disruption of the service is foreseen. The dock technology was compatible and integrated with the dock system of Bicimad.
- Installing locks at the Bicimad e-bikes to allow the free-floating operation of the system avoiding vandalism.
- Expansion of Bicimad system by adding bike stations beyond the first ring road of the city, enlarging the Bicimad system to all districts of the city and linking them with two Park & Ride facilities.

3.2.2. Measure M6

To promote the use of clean mobility (zero emissions), and the smart use of energy, measure M6 includes 3 actions:

- Installing EV chargers in BiciPARK secure underground cycling parking facilities managed by EMT.
- Upgrading “Electro-EMT” (EMT service App for the management of public fast charging infrastructure) by developing and integration API, allowing citizens to charge the clean vehicles with the same mobility pass than can be used to accessing to the other public transport modes (bus, bikes...)
- Developing a V2G (Vehicle to Grid) pilot in a P&R facility. Considering the innovative of the V2G technology and the administrative and regulation issues still to be deal with, the most convenient technical solution was analysed as well as how should be this pilot put in a real scenario.



3.2.3. Measure M7

The measure consists of the assessment and implementation of car free areas not only in the city centre but also at outer districts to enhance active mobility and increase liveability of dense city areas promoting active mobility. In order to do so there are 2 main actions:

- Enlargement of the pedestrian Puerta del Sol square transforming it into a zero emissions zone.
- Assessment and deployment of new pedestrian zero emissions zones in the rest of the districts of Madrid

Several pedestrian areas were projected with the aim of improving air quality, accessibility, safety in the surroundings of schools and also to promote local commerce. To define the location, historic city centres, areas with a shortage of pedestrian space and the proximity of markets, health centres, educational establishments and public transport access areas were analysed in the 21 districts of the city.

One critical factor was the accessibility included in the Urban Accessibility Guideline of the City Council to transform the area into a cleaner and more inclusive one.

3.3. Overview of Turku measures

3.3.1. Measure T6

In this measure an inclusive sustainable mobility activation model was designed, tested in two kindergartens and in three schools and then scaled up to six units. The model aims to increase the skill sets of children and families on sustainable transport modes. In addition, the physical conditions are mapped and improved in the test units to support the activation. A specific focus was placed on targeted communication activities in the test units and on inclusive services.

As part of the activation model, the pilot sites were recruited, and to do so, several communications activities were done in collaboration with traffic planners to inform children and their parent's about the project. Indeed, after the cycling skill tests were carried out with the children, a cycling skills task card was produced as an incentive to inform parents about cycling skills of their children and to raise enthusiasm of children to practise.



Highlighting the importance of stakeholders' cooperation, the regional PT operator incorporated some walking and cycling related information into existing public transport related school material and the sports services of the city of Turku designed a brochure on everyday movement of small children for the use of health care professionals meeting each family on yearly basis to affect parent's and families' habits.

Also, within this measure, a minimum of three new bicycle services (e-cargo bikes, children's bikes and repair stations,) and e-bike-sharing were designed, piloted, analysed and scaled up accordingly. Due to the political decisioning, the e-bike-sharing was changed into e-cargo bike-sharing and other bicycle services were piloted.

The cargo bike sharing was promoted through social media, newsletters and press releases. Discount codes for the cargo bikes have been distributed to attract new users to try them out as part of the promotional campaign. The new system became very popular is now running without support from the city.

Moreover, children e-busses, fitting six kids, were procured and have been in active use by day cares. An internal bicycle rental platform was designed and launched helping to reserve and distribute the children's bikes and e-busses.

Bike repair stations and the first public bike washing station were installed in the city promoting and facilitating therefore the use of this clean mode of transport. And a bicycle repair helpdes was piloted.

3.3.2.Measure T7

To foster carbon free city logistics and construction sites, this measure is split into two. A first sub-measure consisted in the development of a Sustainable Urban Logistic Plan (SULP) to enhance freight distribution processes towards carbon neutrality. It was identified the importance of supporting the development of the SULP for the city. The completed SULP was approved by the City Government in December 2024.

The second sub-measure consisted of the development of a roadmap for the fossil free construction sites following the commitment to the Green Deal that by 2030, 50% of all the construction transportations and sites in the city will be done fossil free. One of the main reasons being the lack of e-machinery at construction sites. To overcome the reluctance to acquire a suitable pilot construction site, it was analysed the perspective on circular economy and conducted a pilot calculation on potential



CO2 emissions savings for one construction site. This study showed that it is possible to carry out 97% of the pilot project's works with electronic machinery.

3.4. Main Challenges and Considerations

As stated in D7.8, the stakeholders involved in developing and implementing the measures had to face several challenges.

3.4.1. Governance and coordination

As it used to be, the governance is a critical factor that is involved in most of the activities and measures implemented in all the cities. The way the City Council cooperates with other stakeholders is a challenge that needs to be overcome.

Lack of cross-sectoral cooperation is a clear barrier for measures that which combines different sectors. Indeed, most of the facilities needs a public-private cooperation due to ownership and regulations. Therefore, getting agreements are vital for transforming the city into a cleaner, safer and more inclusive environment.

However, not only public-private cooperation is request, also among the different public entities since sometimes the internal interest are not always the same.

Although cities define clear strategic targets to increase modal share of walking and cycling, sometimes discrepancies between strategies and the operational reality can make difficult to promote more active modes of transport.

Moreover, it was identified the need for also including the logistic ecosystem in the regulations as another relevant topic when thinking on a user-friendly environment. Measures to consider the operational and the environmental aspects, needs also to be implemented in the cities.

3.4.2. Operational

The operational factor is one of the key challenges for any bike or e-bike sharing system. People will be willing to ride if there a bike available in the immediate surroundings. Otherwise, they will search for an alternative mode of transport. Similar situation when leaving the vehicle. If they have a drop-off point nearby, people will park the bike in the proper place instead of anywhere.

Each transport operator also uses its own route planning application (e.g. Google Maps, Waze, or own company software) which are not always compatible with one another, making it difficult to ensure continuity in route planning. To overcome this



barrier, discussions with stakeholders, and webinars would facilitate getting a common point and having a public application managed by the public authority could significantly improve integration and usability. Another fact that sometimes discourages users to use the share bike system is the lack of adequate infrastructure. Having separate bike lanes will provide a safer feeling and will boost the use. Anyway, this perspective is not the same in the 3 cities as in the northern nodes, they are more willing to use the bikes, which is not the situation in the Spanish cities.

Frequently another challenge that need to be addressed by the authorities is the citizen behaviour. Negative attitudes, lack of motivation and lack of dedicated resources can be significant barriers in measures which require personal involvement, commitment and time. Resilience is needed in promoting the topic among people who do not find the topic important. For this reason, measures should always be tailored based on the observed needs and to meet the resources of the target unit.

3.4.3. Technical

Implementing a unified e-bike-sharing system across a city is not always straightforward, as several technical challenges must be addressed. These include ensuring compatibility of drop-off points and in the case of e-bikes, the charging of them, providing a shared access card, resolving geofencing limitations and ensuring the proper redistribution of bikes.

Technical challenges for the innovative V2G technology are the main barriers nowadays. Choosing of charging point technology is not an easy issue yet because there are different technologies in terms of communication protocol between the electric vehicle and the charging point, and few charging points providers are fully compliant with EU standards. In addition to that, regulation is another challenge, as, for instance, the lack of regulation in Spain for V2G solutions (including the storage of energy in underground environments) has hindered the Madrid measure.

3.4.4. Involvement and communication

One of the main barriers is creating support from both stakeholders and the public on clean mobility solutions. Some projects are often very challenging and require significant investment (such as using the Ring Road works to also include in there heating system) therefore gaining support is essential. Make them understand the win-win situation used to be challenging, but the effort needs to be done to move forward a greener future.



Also to have a robust bike sharing system covering different municipalities, lots of stakeholders need to be involved. A main entity should take the responsibility to convince every municipality/stakeholder individually to extended network across a wider area.

Promotional campaigns to increase public awareness showing all the citizens how the e-bike sharing system works or how to access to it. To let users to dig into this service, temporary free use of the service was applied to promote it.

3.5. Lessons learned from the evaluation process of the measures

After the implementation of the measures, the impact was evaluated within WP7. To do so, the LEM and PEMs participated in the evaluation process.

The main lessons learned from the Antwerp Node are the following:

- It is important to explain – from a very early stage on - the importance of the energy transition to all the different stakeholders. Identifying specific target groups to communicate the importance of clean, safe and inclusive measures, is essential for the success.
- The operator of the FUA-wide bike-sharing system should be involved from the start in communication with municipalities and companies in order to get together to feasible and optimal solutions.
- Having less bikes per hub and more hubs is the best situation for covering a wider urban area.
- There is a willingness among stakeholders involved to work towards safer and more sustainable freight transport.
- There is a clear need in the transport and logistics sector for hands-on tools such as the route planner. However, the sector is reluctant in trying tools that are not mature and there is no certainty to be implemented.
- Data remains a key factor, and it needs to be quantitative and keep updated to assure the quality of the innovative tools such as the route planner for logistics vehicles. Otherwise, the resulting measure will not be useful and will not contribute effectively to decrease traffic accidents with freight vehicles.

The main lessons learned from the Madrid Node are the following:

- Communication campaigns will increase public awareness and will increase the number of users of the public e-bike system. Actions such as the temporary free-use period and the system's expansion successfully promoted the service and increased ridership.
- Effective communication about the implementation process is crucial for smoother execution, particularly regarding changes to public transport routes.
- The expansion of the e-bike sharing system to all the districts of the city was a success, with potential for broader regional coverage.
- The deployment and integration of the mobile bike station offer flexibility and opportunities for better adapting to the real demand and coping with events.
- Providing secure bike parking (BiciPARK) also incentivizes the use of bikes.
- Overcoming timing and regulatory challenges required flexibility and strategic planning. Aligning timelines, addressing regulatory barriers, and leveraging local and international drivers to optimise implementation outcomes were seen of high importance. One clear example of the importance of overcoming the regulation challenges is the V2G pilot in Madrid.
- Governance and coordination are key points that will bring into success the implementation of mobility initiatives. Moreover, integrating different services into just one card or platform facilitates the user to perform multimodal trips and also to select cleaner and more inclusive mobility transport modes.
- There is a large support for pedestrianisation in the assessed areas, and even larger than expected. Additional actions such as reducing speed limits near schools, renovating and improving accessibility in areas with facilities for the elderly, have positively supported pedestrianisation efforts.

The main lessons learned from the Turku Node are the following:

- Tailored approaches are needed based on age groups, surroundings, skills, and prevailing social norms. Targeted surveys to measure potential mode changes needs to be planned to track quantifiable impacts of the activation model.
- Political, strategic and operational support is essential for promoting clean, safe and inclusive actions.
- Cross-departmental cooperation is crucial for measures affecting children, schools, or kindergartens, involving education, leisure, sustainable mobility, facility services, traffic planning, and collaboration with parents and staff.



- Raising organisational awareness about the benefits of active and sustainable school trips, leading to more frequent interdepartmental collaboration is crucial.
Regular data collection at national and local levels is important, with discussions on implementing local data collection in leisure activity surveys.
- It is beneficial to integrate the development of a Sulp as part of the Sump process. Sulp opens up the possibility to create synergies with companies that traditionally have not been addressed by the city before in the mobility context.
- The content of the Sulp must be presented as simply as possible. Politicians, stakeholders, and city residents may not understand “planning language” without writing the matter in the most comprehensible form possible.
- The importance of stakeholder cooperation cannot be accentuated enough. The more and the earlier the stakeholders are included in the planning work, the easier it is for the stakeholders to react to the changes.
- Implementation of the Green Deal requires a lot of work on national level and co-operation between municipalities. In order to get e-machinery used, it is vital that more municipalities demand the reduction of emissions and follow the process with comparable calculations.
- In order to get e-machinery it is necessary to enable small operators to carry out investments and showcase the benefits of e-machinery at constructions sites for the different stakeholders.
- E-machinery at the construction sites is just a small part of the construction site impact, therefore a larger scope is needed. Only a small portion of the constructions currently carry out necessary documentation for the comparability calculations. There is still a long way to develop green construction sites.

4. Guidelines for implementing clean and safe mobility solutions

4.1. Planning and design of measures

The first step in the planning for clean, safe and inclusive measures is to identify the user and situational needs. **Understanding the mindset of the citizens and also the**



cultural scenarios are key points to promote successful measures that follows the Green Deal commitment and the local and national regulations.

A well-structured portfolio of clean and safe mobility solutions delivers multiple advantages to urban areas. **Aligning timing and regulatory challenges** requires strategic planning and having a clear idea of the strategies and main concerns of the cities. Infrastructure designed to support clean mobility (be it solar-powered charging stations or safe pedestrian walkways) must align with broader urban development goals. Taking advantage of certain infrastructural works to implement cleaner solutions such as the heating system or the bike lanes construction will be beneficial and also earns money to the administrations avoiding redoing building sites.

Linking interventions to city-wide or regional strategies helps secure funding and continued political backing. This alignment can also facilitate scaling solutions beyond pilot districts or single corridors.

Considering the timelines, addressing regulatory barriers, and leveraging local and international drivers to optimise implementation outcomes were seen of high importance.

It is essential to **communicate from the very beginning the importance** of transitioning towards a cleaner and more inclusive environment, in order to engage all relevant stakeholders and ensure their active involvement.

Among the measures aimed at achieving more climate-neutral scenarios are those related to promoting active travel modes, as well as regulating the logistics ecosystem. The latter plays an increasingly significant role in daily urban life, especially as e-commerce continues to expand its presence in cities.. Incorporating freight movements into multimodal planning is crucial for safety and efficiency.

Pushing toward a cleaner energy development is vital as demonstrated in Antwerp with the creation of the heating system by using the Ring Road construction and in Madrid with the analysis of the V2G innovative technology to better fit with the supply needs.

Taking advantage of the implementation of such a huge **infrastructural element** like the Ring Road that makes a better distribution traffic and avoid congestion inside is also used to implement heat pipes or reservation lanes for the city-wide district heating network from the port. This highlight the importance of planning activities from a broader perspective to be beneficial for the users and the cities.

In the case of the V2G in Madrid, managing the supply energy adapting the flow from the grid to the vehicle and vice versa, is directly linked to the **planning**, since it **will depend on the real needs at each specific moment**.

This factor is also a key point regarding the bike sharing schemes. Defining the location of the dockers/hubs, to what extent the service is in the different sectors of the cities and/or the FUA is crucial for a good acceptance of the service among the users. The success of the system highly depends on having bikes readily available in the immediate surroundings. It was identified that having less bikes per hub and more hubs is the best situation for covering a wider urban area.

Planning and regulating **urban logistics** are another type of measure included in the 3 urban nodes. Targeted freight routing, traffic calming around active travel routes, and robust infrastructure contribute to fewer collisions.

The creation of a safe route planner was the action carried out in Antwerp; avoiding congested, pedestrian and school areas will contribute to safer streets and also cleaner thanks to the reduction of commercial vehicles driving through them. The combination of the SULPs and the SUMP is also vital for a coherent planning system as it is being done in Turku. Also, Madrid pays especial attention to logistic planning, although its measure is included as part of the WP3 field of intervention by setting underground facilities with reserved space for delivery vehicles.

4.2. Governance and regulation issues

Implementing clean, safe and inclusive mobility solutions used to involve many stakeholders as seen in all the measures carried out in SCALE-UP since they embrace public authorities, private entities, transport operators, urban logistics and so on. Therefore, it is crucial to engage all stakeholders with a shared objective: transforming the area into a more citizen-friendly space, thereby enhancing quality of life.

Defining clear governance structures at the onset reduces administrative delays and conflicting mandates. Stakeholders should formalize commitments (e.g., public-private partnership agreements), ensuring accountability throughout each project phase.

Creating decision groups and workshops with the relevant stakeholders contribute to create a sense of common interest and is a good collaborative scenario for hearing



each other contributions and aligning points of views. These sessions need to be constructive.

As part of the governance models, it is under the scope of the local governments to identify the lines to work on. Making public administrators understand the relevance of getting more sustainable cities as stated in the Green Deal is crucial to move toward a cleaner, safer and more inclusive cities.

Common approaches for the SUMP and SLPs are needed to define the objective in the different coexisting scenarios. To do so, lots of stakeholders need to be involved as it is being done in Tuku, where the SLP was drafted and sent to a reviewing process so as to get the approval of realistic regulations.

Exploring funding programmes at both European and national levels (e.g., Horizon Europe, CEF) can help jump-start large-scale multimodal initiatives, while local governments may also contribute through direct capital allocations.

Last but not least, **regulatory schemes must allow the deployment of innovative solutions and provide legal coverage** for the different mobility solutions.

4.3. Digitalization

Although the digital layer is analysed in WP4, the reality is that most measures incorporate a digital component, as it is a cross-cutting issue..

The **active modes** should be considered at the same level as the other means of transport like buses or subway. Therefore, they will have **to be included in the public transport platforms or MaaS** as done in the "Smart Ways to Antwerp" application: when planning a journey, bikes were offered as an option too.

Another alternative was the one followed in Madrid of **integrating the rental and payment of the bike system in the same card than the other modes of transport**. By doing so, the user can choose the most suitable mode, even the bikes. Another clean service included in the MPaaS card during the project was the integration of the charging points for electric vehicles.

Considering the e-commerce has considerably increased in the last years, the logistic ecosystem has become into a complex system that needs to be managed to avoid big trucks and other pollutants heavy vehicles driving into the city. **Creating a logistic route planner** that avoid the overcrowded areas or those with vulnerable users as the schools or leisure activities, contributes to helping the logistic vehicles to



find the optimal way to get to the destination and **provides citizens a safer environment**. Lower greenhouse gas emissions, improved air quality, and minimized noise pollution.

4.4. Behavioural issues

Acting on the behavioural perspective is a crucial point. Unless people become aware of the relevance of choosing sustainable modes of transport, society will not suffer a deep transformation.

Identifying specific target groups to communicate the importance of clean, safe and inclusive measures, is essential for the success as it was done in the SCALE-UP urban nodes.

Communication campaigns are particularly relevant as shown in Turku. Organizing cycling lessons, specific campaigns, speaking to the relevant actors contributes to promote the activation models. Providing a deeper understanding of the benefits in health and towards the environment will push the behavioural change.

Another promotional campaign that could help attract users is the implementation of **free trial days**. This would give citizens the opportunity to test the service and experience the bikes firsthand. However, attracting users is not always easy, and the response may not meet expectations. Becoming a deep behavioural change is hard, but we must push forward and try to achieve it by all the means.

5. Conclusions and next steps

5.1. Contributions to SCALE-UP

This deliverable (D5.3) synthesizes the experiences gathered through WP5 and WP7, highlighting how clean, safe, and inclusive mobility solutions can significantly transform urban travel patterns. By documenting the successes, challenges, and lessons learned across Antwerp, Madrid, and Turku, the report offers a structured overview of approaches that support the broader SCALE-UP objectives:

- Decarbonization and road safety: Integrating renewable energy and advanced routing technologies proved instrumental in reducing emissions and minimizing conflicts with vulnerable road users.



- Behavioural change and inclusivity: Inclusive cycling campaigns, shared e-mobility fleets, and targeted outreach contributed to higher rates of active travel and equitable access for diverse populations.
- Data-driven adaptation: Real-time monitoring and iterative improvements ensured that measures remained responsive to evolving conditions, thereby maximizing effectiveness and user acceptance.

Collectively, these findings align with SCALE-UP's overarching aim to accelerate the adoption of user-centric and data-driven mobility solutions, positioning WP5 as a key pillar in demonstrating how cleaner, safer transport ecosystems can be achieved at scale.

5.2. Future challenges and research directions

Looking ahead, several key themes merit deeper exploration and sustained collaboration:

- Technological evolution: New developments in electric vehicle batteries, autonomous driving, and Internet-of-Things (IoT) applications have the potential to expand the scope of clean, safe mobility solutions. Cities may need to adjust infrastructure plans or regulatory frameworks accordingly.
- Resilience to climate extremes: As extreme weather events become more frequent, future measures must address infrastructure durability and service continuity. This includes integrating climate adaptation strategies into transport planning and maintenance routines.
- Extended social equity: While WP5 measures have positively impacted multiple user groups, further research is needed on how best to target underserved communities, bridging persistent gaps in affordability, geographic coverage, and accessibility.
- Refined freight ecosystems: Ongoing evolution of e-commerce and just-in-time logistics calls for more sophisticated routing and consolidation solutions. Zero-emission vehicles and data-sharing platforms can bolster efficiency, but regulatory harmonization remains a challenge.
- Cross-border collaboration: SCALE-UP findings suggest strong potential for regional or transnational networks of clean and safe mobility corridors. Pursuing joint funding opportunities and shared data protocols can expand the footprint of successful pilots and reduce duplication of efforts.

Addressing these areas through continued dialogue, research, and pilot initiatives will not only enhance the legacy of WP5 measures but also drive the next generation of



innovation in sustainable urban transport. Ultimately, this direction aligns with the European Union's goals of fostering smart, green, and inclusive growth, reinforcing the role of mobility as a catalyst for resilient and thriving urban communities.



6. Annexes

6.1. Annex 1. Glossary of terms

Table 1 – Glossary of terms useful for readers.

Glossary of Terms	
Term	Meaning
WP5	Work Package 5. The work package dedicated to Clean, Safe, and Inclusive Mobility Solutions within SCALE-UP.
D5.2	Deliverable 5.2 - <i>Final Report on Implementation of accessible and affordable innovative clean and safe mobility solutions</i> . The previous deliverable detailing the final implementation of accessible and innovative clean mobility solutions.
D5.3	Deliverable 5.3 (this document) pertaining to WP5. Focuses on guidelines and recommendations to implement an urban nodes network approach of multimodal hubs, building upon the outcomes of D3.2.
T5.5	Task 5.5 within WP5. The specific task focusing on lessons learned and solution portfolio development for clean and safe mobility measures in urban nodes. This task culminates in D5.3.
DRT	Demand-Responsive Transport. A flexible mode of public transport where vehicles (often minibuses) pick up and drop off passengers based on demand rather than following a fixed route or schedule.





FUA	Functional Urban Area. A metropolitan area or city-region that often extends beyond official municipal boundaries, characterized by high levels of economic and social interaction (commuting, services, etc.) between a central city and its surrounding areas.
GTFS	General Transit Feed Specification. A common data format used by public transport agencies to publish schedules and associated geographic information, enabling third-party applications (e.g., trip planners) to integrate and display consistent timetable data.
KPI	Key Performance Indicator. A measurable value used to track performance against strategic or operational objectives. In the context of mobility hubs, examples include passenger throughput, modal split changes, reliability, and user satisfaction ratings.
MaaS	Mobility as a Service. A digital platform concept where users can plan, book, and pay for multiple types of mobility services (public transport, car-sharing, bike-sharing, taxis, etc.) through a single interface or subscription.
Micro-Hub	The share of total trips made by each type of transport mode (e.g., private car, public transit, bicycle, walking). Increasing the share of sustainable modes (transit, active travel) is often a key policy target.
Multimodal Hub	A physical location or facility designed to enable convenient transfers among multiple modes of transport—such as buses, trains, shared mobility options, and active travel networks—often including various user amenities.
Modal Split	The share of total trips made by each type of transport mode (e.g., private car, public transit, bicycle,





	walking). Increasing the share of sustainable modes (transit, active travel) is often a key policy target.
P+R or P&R	Park and Ride. A parking facility integrated with public transport services. It allows travellers to leave private cars or bicycles in a secure lot and transfer to buses, trains, or other shared modes for onward journeys, typically to a city centre.
PPP	Public-Private Partnership. A collaborative arrangement in which the public sector partners with private entities for the financing, development, and/or operation of public infrastructure projects—such as multimodal stations or integrated transport services.
SUMP	Sustainable Urban Mobility Plan. 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 practices and takes due consideration of integration, participation, and evaluation principles.
TEN-T	Trans-European Transport Network. A European Union initiative to build and upgrade a Europe-wide network of transport infrastructure, including roads, railways, inland waterways, ports, and airports, to improve cross-border connectivity and economic cohesion.

