

Recommendations to integrate ULaADS in SUMP and Sulp

ULaADS D6.2: Guidelines, methods & policy
recommendations to integrate ULaADS in SUMP and
Sulp processes

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Project abstract

ULaADS sets out to offer a new approach to system innovation in urban logistics. Its vision is to develop sustainable and liveable cities through the re-localisation of logistics activities and re-configuration of freight flows at different scales. Specifically, ULaADS will use a combination of innovative technology solutions (vehicles, equipment and infrastructure), new schemes for horizontal collaboration (driven by the sharing economy) and policy measures and interventions as catalysts for a systemic change in urban and peri-urban service infrastructure. This aims to support cities in the path of integrating sustainable and cooperative logistics systems into their sustainable urban mobility plans (SUMPs). ULaADS will deliver a novel framework to support urban logistics planning aligning industry, market and government needs, following an intensive multi-stakeholder collaboration process. This will create favourable conditions for the private sector to adopt sustainable principles for urban logistics while enhancing cities' adaptive capacity to respond to rapidly changing needs. The project findings will be translated into open-decision support tools and guidelines.

A consortium led by three municipalities (pilot cities) committed to zero emissions city logistics (Bremen, Mechelen, Groningen) has joined forces with logistics stakeholders, both established and newcomers, as well as leading academic institutions in EU to accelerate the deployment of a novel, feasible, shared and ZE solutions addressing major upcoming challenges generated by the rising on-demand economy in future urban logistics. Since large-scale replication and transferability of results is one of the cornerstones of the project, ULaADS also involves four satellite cities (Rome, Edinburgh, Alba Iulia, and Bergen) which will also apply the novel toolkit created in ULaADS, as well as the overall project methodology to co-create additional ULaADS solutions relevant to their cities as well as outlines for potential research trials. ULaADS is a project part of ETP ALICE Liaison program.

Keywords

Urban logistics, sustainability, SUMP, Sulp, pilots, policy recommendations, Trialling, Mechelen, Groningen, Bremen

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Executive summary

The deliverable D6.2 “Guidelines, methods & policy recommendations to integrate ULaADS in SUMP and Sulp processes” focuses on driving factors, barriers, and key elements for successful pilot and trial implementation regarding SUMP or Sulp development. To this end, itmeso level consideration of the experiences gathered during the trials carried out in the three lighthouse cities in the ULaADS project until this phase, as well as shedding light on other international urban logistics planning practices. The perspective taken is one at the meso-level to keep the analysis and recommendations transferable and relevant to other cases. Thereby, this deliverable inform about and facilitate ULaADS schemes’ large-scale implementation and optimal alignment with cities’ SUMP and Sulp processes.

Table of contents

ULaADS contributing to green urban logistics in European cities	7
1. SUMP and Sulp as key instruments to plan for a greener urban logistics	10
1.1 Introduction to the SUMP and Sulp framework	10
1.2 Relevance of SUMP & Sulp to ULaADS Project	13
1.3 Policy Frameworks and Regulatory Support for SUMP and Sulp Integration	16
1.4 Strategic urban logistics development with stakeholders	21
2. The implementation of urban logistics measures.....	26
2.1 The importance of a proper legal framework.....	26
2.2 Working together with stakeholders on urban logistics measures	34
2.3 Looking for the right technology and innovation	39
2.4 Generating impact: Data, indicators and monitoring	42
3. Setting the scene for urban logistics implementation through Sulp	46
3.1 Fostering flexibility and resilience in dynamic urban logistics.....	47
3.2 Inclusive stakeholder engagement	48
3.3 Encouraging technological innovation and data driven approaches	49
3.4 Optimized space allocation and regulation	50
3.5 Ensuring fair competition in logistics	51
3.6 Learning Processes: Trial-First Approach	51
Acronyms	53
References	54

List of figures

Figure 1: ULaADS Work Package Interdependencies	8
Figure 2: ULaADS Multimodal Urban Logistics in Bremen	9
Figure 3: The Sulp Cycle.....	12
Figure 4: Solutions for Logistics Decarbonisation	14
Figure 5: Delivery Van Blocking a Cycle Lane.....	15

Figure 6: Urban Logistics main stakeholders	16
Figure 7: ULaADS Bpost parcel lockers in Mechelen.....	24
Figure 8: General proposed format of the first local fora for the lighthouse cities in ULaADS.....	25
Figure 9: Draft of a loading/unloading zone for Germany.....	27
Figure 10: ULaADS Groningen’s City Centre Logistics Service Platform – Sharing ZE-vehicles.	31
Figure 11: Pilot project of delivery zone for low emission vans in Bremen – media reaction “car drivers annoyed by eco-parking”	33
Figure 12: ULaADS Cargo bikes in Bremen.....	35
Figure 13: ULaADS Containerized last-mile delivery – heavy-load cargo bikes in Bremen.	42

List of Boxes

Box 1: Defining Urban Logistics	7
Box 2: SUMP / Sulp planning steps in a nutshell along the four planning phases.....	13
Box 3: Case examples of regulatory measures	18
Box 4: Case examples on innovation driven porting SMEs.....	20
Box 5: Groningen: Supporting Innovation in Sustainable Urban Logistics.....	21
Box 6: Global case examples for participation in urban logistics.....	24
Box 7: Incorporating Collaborative Stakeholders through Local Logistics Fora in ULaADS.....	25
Box 8: Harmonisation of urban freight with access regulations.....	28
Box 9: Bremen - Logistics the framework of Sustainable Urban Mobility	33
Box 10: Consolidation Centers & Micro hubs	41

ULaADS contributing to green urban logistics in European cities

Urban logistics refers to the movement and transportation of goods within urban areas, serving businesses, stores, homes, and other city-based destinations. It encompasses not only delivering packages but also managing waste collection, moving building materials, and distributing various goods to retail chains and shops, which includes items requiring controlled temperatures.

The final stretch of transportation, commonly known as the "last-mile" or "last-metre" delivery, holds significant importance as it strongly influences the overall efficiency and customer contentment within the logistics process. This phase marks the ultimate step in the supply chain, encompassing the conveyance of products from a distribution center or retail outlet to the doorstep of the end consumer. It's typically characterized by shorter distances, higher frequency, and numerous individual deliveries.

Creating an effective system for logistics within urban environments demands a network of city structures, including warehouses, consolidation centers i.e., urban logistics mobility hubs, railways, roads, and actual transportation means such as trains, trucks, vans, bicycles, and even pedestrians.

Transport is widely known to be increasingly resistant to decarbonisation efforts worldwide. Urban freight volumes are not an exception and have been growing steadily over the years, driven by factors such as population growth, urbanization, and e-commerce. This is of particular concern as freight transport is accounting for roughly 40% of all transport-related CO₂ emissions and is headed towards causing nearly a tenth of all CO₂ emissions worldwide (Alice-ETP, 2019, p. 7). Moreover, Noise pollution resulting from urban freight transport negatively impacts 100 million Europeans, not only compromising their well-being but also underscoring the pressing need to implement noise reduction strategies and promote quieter logistical practices to enhance the overall quality of urban life (European Environment Agency 2023).

This concern is intertwined with the fact that urban freight constitutes about 50% of total road freight expenses (ITF 2018). Particularly, last-mile delivery, a significant aspect of urban logistics, accounts for an estimated 30-50% of total logistics costs (Atos 2021 & McKinsey & Company 2016). Predominantly, road freight serves as the principal mode of urban freight transportation, representing over 70% globally within urban areas, as assessed by the International Transport Forum (ITF 2022). Furthermore, approximately 30% of freight distances covered within urban areas involve empty vehicles (Eurostat 2020), signifying an opportunity for efficiency improvement in the freight distribution process.

Box 1: Defining Urban Logistics

In Germany for example, a significant 30% of all trips are related to shopping. Within urban areas, the average shopping distance is approximately 4 km. This constitutes about 17% of the total mileage driven and contributes to roughly 10% of transport-related CO2 emissions. Given these needs and the relatively short distances involved, there's a substantial potential for substituting car trips with cargo bike journeys. The ULaADS trial conducted in Bremen exhibits the significant impact of cargo-bike sharing. A remarkable 55% of cargo-bike trips would have otherwise been undertaken by car.

There is the question whether e-commerce and related urban delivery activities increase or reduce transport activities. In that way, logistics doesn't solely revolve around commercial operations; it's equally crucial for private households. This aspect can be labelled as private micro-logistics.

The European Union pursues several strategies to remedy the health-related and environmental consequences of urban mobility of people and goods alike. The most prominent ones certainly are the New Urban Mobility Framework, the Union's 2030 Climate Target Plan, the Sustainable and Smart Mobility Strategy, and the European Green Deal. Currently, the 'Corporate Due Diligence Directive' (CSDDD) is under debate and may lead to the defined responsibility of larger companies to reduce their impacts on the environment – including climate protection – leading also to impacts on the logistics chain. Common to all these approaches is an unequivocal promotion of smart public transportation and all forms of active and shared mobility modes and services (The New EU Urban Mobility Framework, 2021, p. 1).

This spirit is also reflected in all work packages of the ULaADS project. The ULaADS project aims to develop a new system for urban logistics that promotes sustainable and liveable cities. This involves the re-localisation of logistics activities, reconfiguration of freight flows, and the use of innovative technology, collaboration schemes, and policy measures to bring about systemic change. The project works with stakeholders to create a framework for urban logistics planning that aligns with market, and government needs. This will help the private sector adopt sustainable practices and enhance cities' adaptive capacity to respond to the changing urban logistics landscape.

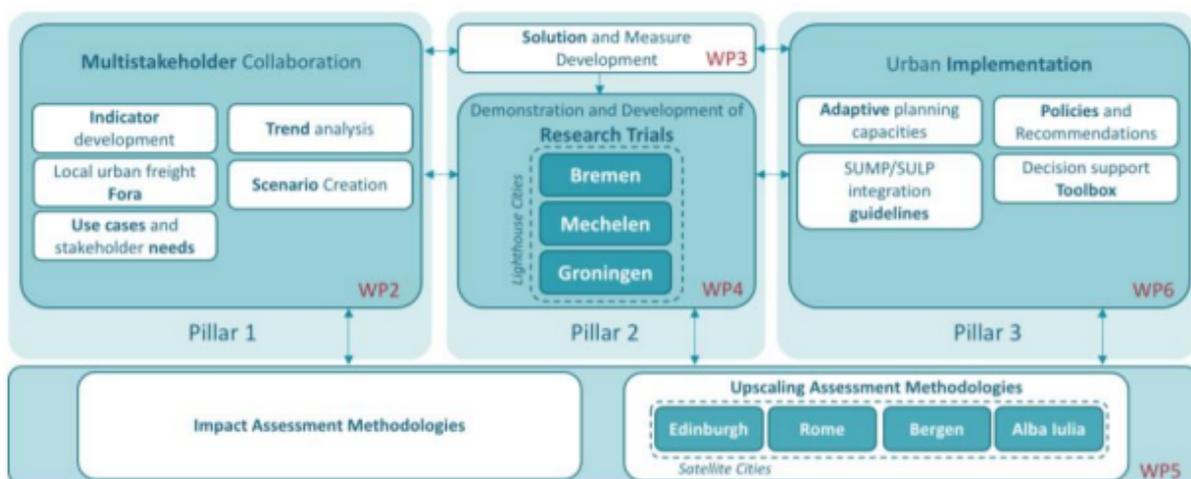


Figure 1: ULaADS Work Package Interdependencies

Source: ULaADS D4.1 "Framework for effective trialling", p. 7

ULaADS is a collaboration between three pioneering municipalities committed to zero emissions city logistics (Bremen, Mechelen, and Groningen), logistics stakeholders, academic institutions, four satellite cities (Rome, Edinburgh, Alba Iulia, and Bergen), and various follower cities that complete the ULaADS community of practice. The project intends to accelerate the deployment of feasible and shared zero-emission solutions for urban logistics, with a focus on addressing the challenges generated by the on-demand economy. The project is part of the ETP ALICE Liaison program and has a strong focus on large-scale replication and transferability of results



Figure 2: ULaADS Multimodal Urban Logistics in Bremen

This document is designed to provide guidance on the integration of ULaADS schemes within the context of SUMP and Sulp development processes. The focus of this document is to outline the driving forces, obstacles, and critical components for effectively piloting and trialling ULaADS schemes within the three lighthouse cities. This approach is tailored to the meso level, ensuring that the analysis and recommendations can be applied to other similar scenarios. Consequently, this deliverable aims to inform about and facilitate the incorporation of ULaADS schemes into city-wide implementations. This guidance document primarily caters to local government authorities, urban planners, and actively involved private sector stakeholders seeking to provide services in alignment with ULaADS schemes.

1. SUMP and Sulp as key instruments to plan for a greener urban logistics

The demands on urban planning and the range of tasks have increased enormously in recent years, and a variety of reasons contribute to a further increase in complexity in regions, cities, and municipalities. In addition to the need for modernization and expansion of the mobility system, the accessibility of locations for trade commerce and logistics must be ensured, and access to social facilities must be guaranteed for the population as well as the safety of road users. Contemporary issues such as achieving climate neutrality and adapting to irreversible climate change, but also strategies to improve the resilience of the mobility system in the face of crises and disasters are gaining importance. Also, citizens are increasingly interested in mobility and future issues, and, in some cases, professionally acting interest groups are increasingly demanding a say in planning decisions.

Another challenge is to manage complex processes within the framework of existing laws and regulatory areas based on existing administrative structures and to lead them to success. Integrated planning processes today usually involve several departments such as transport, environment, urban development, and communications, as well as several planning levels, and when it comes to freight and logistics, private actors need to be integrated. Moreover, planning activities often extend beyond the city limits and administrative boundaries, because transport and mobility systems are networked with those of neighbouring municipalities in the region, particularly via commuter traffic, and regarding freight transport with the higher-ranking networks of road and rail.

Overall, new paths must be taken in many respects. Urban planning and its organizations are challenged to develop targeted and effective responses within the framework of existing structures; taking into account the financial and human resources that have both short and long-term effects. The Sustainable Urban Mobility Plans are an attempt to take better account of these challenges through a practical concept and to offer concrete guidance to planners and decision-makers.

1.1 Introduction to the SUMP and Sulp framework

Sustainable Urban Mobility Planning (SUMP) sets a new standard for innovative transport planning and strives for a comprehensive approach and development of the transport system in an urbanized area, which is presented in an integrated vision with a high degree of continuity and is backed by verifiable targets. Mobility planning sees the interrelationship between the built environment with all its infrastructure, the (behavioural) lifestyle aspects and the transport system. Appropriate measures should lead to better accessibility and quality of life. As a rule, all planning elements (mission statement, goals, measures) are summarized in a strategy document to which the specialized planning is oriented.

SUMP contributes to improved accessibility and quality of life through a shift towards sustainable mobility. It supports fact-based decision-making guided by a long-term vision. This requires a thorough assessment of the status quo and future trends, a shared vision with strategic objectives, and an integrated set of measures from different policy areas, including regulation, promotion, financing, technology, and infrastructure. The SUMP concept places particular emphasis on the involvement of citizens and stakeholders and the cooperation among actors in public administrations and with the private sector to agree on key mobility goals, such as better air quality, improved accessibility, and mobility, increased road safety, decreased traffic noise, higher energy efficiency, and enhanced quality of life and helps cities and regions to reduce their climate impact from transport.

Sustainable urban logistic planning (SULP) shares the general approach as SUMP of strategic, integrated, and participatory planning but aims to improve efficiency, safety, and sustainability with the focus on the movement of goods in urban areas. It considers all aspects of urban logistics, including freight transport, delivery, distribution, and last-mile logistics, and seeks to optimize the use of existing infrastructure and resources. Here, we see an interdependence with the objectives of the CSDDD, which targets larger companies in their production and delivery chain.

A SULP also involves a participatory process that engages sector-specific stakeholders, not only transport authorities, but also logistics operators, retailers, residents, and public authorities, in the planning and implementation of logistics policies and measures. In contrast to Urban Mobility, the landscape of urban logistics is significantly influenced by the active participation of private businesses, including Small and Medium-sized Enterprises (SMEs). This dynamic involvement of private entities adds a pivotal layer to the complicated fabric of urban logistics. Consequently, the process of engaging stakeholders in sustainable urban logistics planning becomes notably more complex due to the system's fragmentation. Whereas the SUMP widely deals with assets and instruments directly in the hands of public authorities (e.g. road infrastructure, regulations, enforcement, public transport etc.), the logistics sector is composed of competing market players. The public sector sets the scene for the operation of the private logistics sector and competing players to act under the same conditions. Therefore, SULP measures need to be non-discriminatory and consider the interrelationship with urban development (e.g., when looking at access restrictions for certain areas).

A full SULP process, which at the end delivers an Urban Logistics Strategic Plan includes an analysis of the existing logistics system, identification of logistics challenges and opportunities, and the development of a long-term vision and goals for sustainable urban logistics. It also includes a set of actions and measures, such as optimizing delivery routes, promoting the use of low-emission vehicles, and improving last-mile delivery options, that are prioritized and implemented over time to achieve the vision and goal (SULP Guide, 2019, p. 11).

This process, or 'SUMP cycle', consists of four phases with three steps each, each further subdivided into a total of 32 activities; five milestones additionally structure the process. The representation as a 'clock' signals a chronological sequence; in fact, it is an (ideal-typical) logical, rather than sequential, representation. In practice, activities are often carried out in parallel and necessary feedback is considered. In any case, these are general recommendations based on the practical experience of the planners involved in the development, and each must be adapted to its own planning context.



Figure 3: The Sulp Cycle

Source: Sulp Guide, 2019, p. 15

The planning horizon of a SUMP usually covers a period of ten years for strategic planning, while the planning of measures often covers the next two to three years. In addition to practical advantages, this frequently chosen division into two parts also includes the possibility of flexibly taking evaluation results into account and incorporating new findings or technological solutions into the implementation.

A key feature of SUMP is that the concept is designed as a 'change management process', in which adjustments are made again and again based on a catalogue of goals and a knowledge base, and changes are actively addressed.

Box 2: SUMP / Sulp planning steps in a nutshell along the four planning phases

1. The inception Phase / Initiation and Capacity Building:

In the inception stage, policymakers must make a deliberate choice to develop a SUMP or Sulp within a defined urban region. This entails creating a functional management structure and initiating a capacity-building initiative. With these foundations in place, an in-depth analysis of the current mobility situation is conducted, assessing financial and institutional capabilities, identifying mobility issues, and recognizing opportunities for improvement.

2. Vision and Strategy Development:

Transitioning to the second phase, the focus shifts to shaping the future urban mobility landscape based on the findings of the previous analysis. This involves crafting a clear vision and strategy for urban mobility, in collaboration with stakeholders and users. Various scenarios, including a business-as-usual approach and alternative actions, are weighed against the desired vision. The selected scenario aligning with the SUMP and Sulp vision is then refined for short and long-term implementation.

3. Operational Planning:

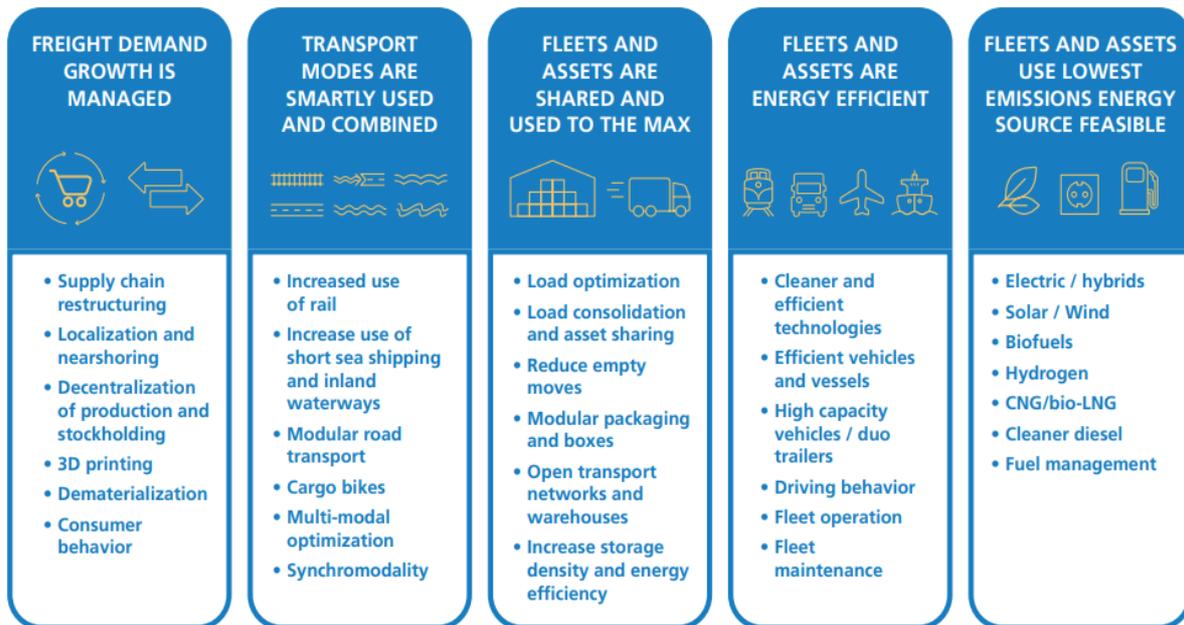
The third phase concentrates on translating the chosen scenario into actionable measures and detailing monitoring mechanisms. These measures are outlined with precision to ensure their comprehensiveness and coherence. A crucial aspect is devising a financial mechanism, identifying funding sources, estimating operational and capital expenditures, and defining financial flows for the entire SUMP and individual prioritized measures. The outcome of this phase is the preparation of the SUMP or Sulp for submission to the relevant political body for approval.

4. Implementation and Monitoring:

The final stage focuses on executing the measures outlined in the approved SUMP or Sulp. This is accompanied by a system of continuous monitoring, evaluation, and communication. The plan is handed over to sectoral planning departments responsible for project implementation according to local and national regulations. Further assessments, like feasibility studies, are commissioned, and plans and tenders for construction are developed. Establishing a monitoring system and effectively implementing it are pivotal components of this stage, ensuring successful execution and adaptive management of the SUMP and Sulp.

1.2 Relevance of SUMP & Sulp to ULaADS Project

Sulp processes and the ULaADS project are closely aligned with the Alliance for Logistics Innovation through Collaboration in Europe's (ALICE) mission to promote innovative solutions that address reducing emissions and improving efficiency. ALICE's activities include the development of roadmaps and white papers that provide guidance on the deployment of innovative and sustainable logistics solutions. The Alice Roadmap towards zero emissions logistics 2050 is such a comprehensive guide that aims to accelerate the transition to sustainable and zero-emission freight transport. The roadmap highlights five Solution Areas that require attention, investment, and innovation to achieve the goal of decarbonizing the logistics sector by 2050, which the following paragraphs are going to take a closer look at.



© Smart Freight Centre and ALICE-ETP based on A. McKinnon 'Decarbonizing Logistics' (2018)

Figure 4: Solutions for Logistics Decarbonisation

Source: Alice-ETP, 2019, p. 12

Urban Freight Transport (UFT) is a profit-making activity that is mainly controlled and run by private entities. However, in many urban contexts, the emphasis within city planning and traffic surveys focuses mainly on passenger transport, disregarding the complexities of urban freight dynamics. Urban freight, in contrast to passenger transport, involves a complex interplay of multiple stakeholders, a diverse range of activities, and data originating from various operators and stakeholders. This complexity extends beyond the power of transportation authorities alone. Adding to this complexity, shippers and transport operators are frequently unwilling to share operational insights, and local authorities might lack clarity on the requisite data or encounter challenges related to the cost of acquiring urban freight-related information. The absence of effective collaboration among participants in urban logistics, coupled with the scarcity of accessible data and information, contributes to an inadequate incorporation of urban freight considerations into the overall urban framework (SULP Guide, 2019, pp. 9-10). UFT can result in conflicts and has negative effects such as safety hazards, congestion, and air and noise pollution. Within the last years, the increase in deliveries with the growth of e-commerce led to serious conflicts in urban neighbourhoods when delivery vans were parked on sidewalks, cycle lanes or blocking narrow streets.

Revolutionary concepts and inventive strategies hold the potential to transform urban logistics systems. Within this realm, efficient urban and spatial planning, as well as, introducing ideas like Urban Freight Mobility hubs, also called Urban Consolidation Centers (UCS), such as Micro hubs and

consolidation centres, are strategically positioned across urban landscapes to refine the final leg of delivery by consolidating goods and deploying smaller, eco-conscious vehicles.



Figure 5: Delivery Van Blocking a Cycle Lane

Photo: M. Glotz-Richter

The effectiveness of such solutions can increase by incorporating thoughtful parking and enforcement tactics including banning heavy trucks in urban areas or having specific operating hours. Furthermore, integrated smart parking systems, supplemented by real-time availability data, emerge as a promising avenue to mitigate congestion and optimize loading and unloading processes. Moreover, the emphasis on technical solutions such as electric vehicles, autonomous delivery robots, and drone-based deliveries shall not only lead to emissions reduction but also heightened efficiency. Still, such technological innovations need to prove in the practical application whether or how they contribute to a more liveable environment (e.g., with potential conflicts of delivery robots and pedestrians), to a cost-efficient operation and to reduction of overall energy consumption (e.g., of drones). Leaning on data-driven technologies and predictive analytics yields superior route planning, demand projection, and real-time tracking, fostering resource optimization and increased customer satisfaction.

As these innovations hold the potential to revolutionize urban logistics networks, fostering sustainability, efficiency, and adaptability, it is vital to acknowledge that addressing the complexities of urban freight necessitates a comprehensive approach that accommodates the diverse stakeholders within the broader logistics ecosystem. Projects such as ULaADS are designed to bridge these gaps and safely pilot innovative solutions to find ways to cooperate and improve efficiency.

1.3 Policy Frameworks and Regulatory Support for SUMP and Sulp Integration

The collaboration of governance and policy framework with the market players of the private sector and citizens i.e. consumers is the backbone of any sufficient resilient system. Urban logistics systems involve diverse key stakeholders: Public authorities, Logistics service providers, business retailers, experts, end consumers, and residents. Public authorities, at local, regional, and national levels, wield the power to establish the fundamental policy frameworks, regulations, and standards that reinforce sustainable urban logistics. Also, Urban planners in collaboration with these authorities, are assigned with the task of designing urban fabrics that facilitate efficient goods movement while harmonizing with broader urban and sustainable development goals. Integral to this process are the transportation and logistics industry players and the retailers who execute these plans, adapting practices, optimizing routes, and embracing innovative technologies to enhance urban mobility. Experts and researchers, a smaller stakeholder group, provide vital input by proposing viable solutions, studying patterns, and analysing project impacts. Furthermore, residents take on a pivotal role as central stakeholders within the urban logistics systems. As both the ultimate consumers and beneficiaries of this complicated network, they stand to gain from its functioning. However, they also bear the impact of an inefficient logistics system that causes congestion, as well as air and noise pollution, significantly affecting their daily lives.

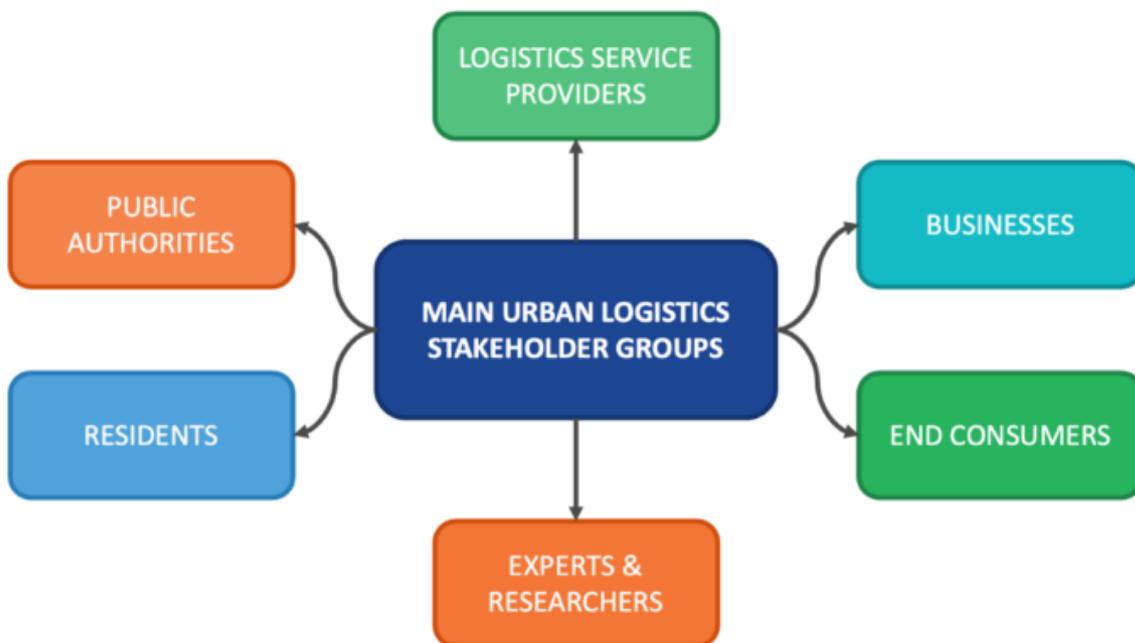


Figure 6: Urban Logistics main stakeholders

1.3.1 Multi-Layered policy planning

To achieve a seamless and effective integration of SUMP and Sulp, it is vital to establish a comprehensive multi-level policy framework that operates across various layers of governance. This framework ensures a synchronized approach to urban mobility and logistics planning, promoting sustainability and efficiency.

Starting at the national level, policy guidelines form the foundation of this framework. These guidelines underscore the necessity of collaboration among governmental bodies, stakeholders, and relevant actors in both urban mobility and logistics sectors. This collaboration serves to harmonize goals, strategies, and initiatives between these two interconnected domains. National-level policies provide a broad direction for urban planning while acknowledging the complex relationship between mobility and logistics. There is an important role with the Highway Code – that may or may not allow to establish loading zones or to restrict access for certain vehicles to defined zones. As well, the national level may or may not give incentives for clean vehicles through the national vehicle taxation and road tolls.

Moving to the regional scale, coordination becomes even more essential. Regional authorities play a critical role in tailoring the overarching national policies to the specific characteristics and needs of their geographic area. This customization ensures that transportation and land use planning are aligned to the unique attributes of each region. By integrating local knowledge and accounting for regional disparities, the policies become more effective in addressing regional challenges. This level of coordination helps in creating a harmonious urban environment where mobility and logistics strategies complement each other seamlessly.

At the local level, the integration becomes tangible through tailored implementation plans. These plans are crafted to reflect the distinct urban contexts of individual cities or localities within a region. Here, the focus shifts from overarching policies to concrete measures that directly impact residents and businesses. Examples of such measures include the establishment of pedestrian zones to encourage non-motorized transport, the implementation of congestion pricing schemes to manage traffic flows efficiently, and the creation of urban consolidation centres (UCS) to streamline the movement of goods.

The European level sets the framework for national regulations of air quality and noise abatement, directly emission standards for motorised vehicles, for CO₂ reduction and with the upcoming CSDDD also for operational requirements in production and delivery.

By adopting this multi-levelled approach, the integration of SUMP and Sulp becomes more than a theoretical concept – it transforms into a practical strategy that addresses the dynamic challenges faced by urban areas. The framework not only ensures a consistent alignment between mobility and logistics planning but also facilitates collaboration between different levels of governance and a variety of stakeholders. In turn, this contributes to the creation of sustainable, well-connected, and liveable urban environments on a regional scale.

1.3.2 Regulatory Measures

For an efficient and safe mobility system, it is of the greatest importance that all involved players act according to the same rules. The best regulatory approach does not function when not applied in daily life – which may require not only awareness and information but as well enforcement.

The implementation of regulatory measures holds a crucial role in promoting and incentivizing sustainable urban logistics practices. By harnessing the power of regulations, cities, and regions can effectively steer the trajectory of their logistics systems towards environmentally responsible and efficient outcomes.

One of the most impactful strategies within this regulatory framework is the framework of restrictions, enforcement on one hand and incentives on the other hand. Such positive reinforcements encourage businesses and logistics providers to adopt sustainable practices- especially when combined at the same time with disadvantages for unsustainable procedures. Incentives will provide some better acceptance than pure restrictive measures. Financial incentives, such as tax breaks, subsidies, and grants, play a significant role in mitigating the initial costs associated with transitioning to eco-friendly logistics solutions and embracing low-emission vehicles. These incentives can originate from different administrative tiers; subsidies are often established at the national level, while tax breaks can be implemented regionally or locally. By lightening the financial burden, these incentives not only make sustainable options more accessible but also accelerate the adoption of technologies that have a reduced environmental impact.

Conversely, regulatory measures can also wield influence through penalties and disincentives. By introducing consequences for non-compliance with sustainable logistics regulations, urban authorities can actively discourage the persistence of unsustainable practices. These penalties can encompass a range of strategies, from imposing restricted operating hours for certain types of vehicles to establishing strict emission standards that must be met. These disincentives create a tangible cost for engaging in unsustainable behaviours, prompting businesses to reassess their strategies and make the necessary adjustments to adhere to sustainable guidelines.

Box 3: Case examples of regulatory measures

Regulatory measures

Policy and regulation play a pivotal role in shaping the structure of sustainable urban logistics systems. For instance, in China, diesel trucks are categorized as either green or yellow, contingent upon their adherence to emission standards. Imposing restrictions on the entry of yellow-labelled vehicles in numerous major cities serves to encourage the adoption of more environmentally friendly alternatives. Moreover, the Japanese Government has implemented the initial fuel economy standards for new medium- and heavy-duty diesel vehicles, with the objective of enhancing the fuel efficiency of commercial transport and curbing its ecological footprint.

Additionally, incentives and certifications hold notable potential in enhancing urban freight systems. Chile's Giro Limpio program endorses logistics operators and cargo-generating companies that opt for certified carriers. By stimulating the usage of certified carriers, the program contributes to a reduction in energy consumption, greenhouse gas emissions, and local pollutants.

Furthermore, Hong Kong initiated a one-time incentive measure enabling truck owners to replace older, less ecologically sound vehicles with more contemporary models. This measure yielded substantial enhancements in the quality of roadside air.

Likewise, in London, the Green Truck Certification program—known as the Fleet Operator Recognition Scheme (FORS)—offers a voluntary certification platform for fleet operators to showcase their commitment to sustainable practices. This program evaluates and certifies operators based on a spectrum of criteria encompassing vehicle emissions, driver training, fuel efficiency, and route planning. Gaining FORS certification allows operators to garner acknowledgment for their endeavors aimed at minimizing the environmental impact of their freight operations.

The combined effect of both incentives and penalties is a powerful tool in shaping the behaviour of urban logistics players. Businesses are not only motivated to embrace sustainable practices by the appeal of benefits but also deterred from engaging in environmentally harmful actions due to the potential negative consequences. This multifaceted approach reflects an understanding of human behaviour and the factors that drive decision-making.

Ultimately, the success of these regulatory measures hinges on clear communication, transparent guidelines, and a balanced approach that considers the diverse needs of businesses, the community, and the environment. By strategically aligning incentives and penalties, urban areas can harness regulatory mechanisms to propel their logistics systems toward greater sustainability, reduced emissions, and enhanced urban liveability.

1.3.3 Supporting innovation and SMEs

A pivotal aspect of advancing urban logistics operations lies in the robust support system designed to encourage innovation and empower Small and Medium-sized Enterprises (SMEs). Recognizing the vital role that SMEs play in the urban logistics landscape, initiatives that foster their growth are of the highest importance. These enterprises not only contribute significantly to the economic fabric of cities but also wield considerable influence over the efficiency and effectiveness of urban logistics systems.

Central to this endeavour is the provision of targeted support to SMEs. This support is multifaceted, encompassing financial assistance and capacity-building initiatives. By offering financial incentives, such as grants or low-interest loans, SMEs are encouraged to invest in environmentally friendly vehicles, advanced technologies, and employee training programs. This financial boost not only

alleviates the upfront costs associated with adopting sustainable practices but also creates a more level playing field for SMEs to compete in the evolving logistics landscape.

Additionally, capacity-building initiatives are instrumental in nurturing SMEs and enabling them to embrace innovative practices. Workshops, training sessions, and mentorship programs equip these enterprises with the necessary skills and knowledge to implement modern logistics strategies effectively. Empowered with the knowledge to integrate efficient route planning, utilize advanced tracking systems, and leverage alternative energy sources, SMEs are better equipped to drive positive change within urban logistics.

Innovation emerges as a transformative force within this context, with the potential to reshape urban logistics practices. Innovation funds and living labs are at the forefront of this movement, serving as catalysts for the development and implementation of ground-breaking logistics technologies. These platforms provide essential resources, expertise, and testing environments for pioneering solutions. From smart routing systems that optimize delivery routes and reduce congestion to last-mile delivery innovations that enhance convenience and efficiency, innovation can be found in every facet of urban logistics.

In conclusion, the support and empowerment of SMEs are pivotal to the progress of urban logistics operations. By extending financial assistance and capacity-building initiatives, cities can cultivate a dynamic environment where SMEs thrive and contribute significantly to the logistics landscape. Coupled with innovation driven by dedicated funds and living labs, this comprehensive approach ensures that urban logistics continuously evolves, becoming more sustainable, efficient, and responsive to the needs of cities and their inhabitants.

Box 4: Case examples on innovation driven porting SMEs.

Financing and Supporting SMEs

Acknowledging the global significance of Small and Medium Enterprises (SMEs) in driving the shift towards more environmentally friendly and sustainable urban freight practices, a variety of projects have been introduced worldwide, exemplified by the following instances.

In Scotland, the Low Carbon Transport Loan has been established to extend cost-effective financing options to SMEs seeking to procure low-carbon vehicles, including electric vans and trucks. This program features advantageous interest rates and adaptable repayment conditions.

Similarly, Singapore's Green Loan Scheme for Commercial Vehicles presents favourable loan conditions and interest rates to SMEs aiming to acquire eco-conscious commercial vehicles, such as electric or hybrid trucks.

These initiatives motivate SMEs to invest in cleaner vehicle options, thus reducing their carbon impact, while also delivering financial incentives that render the transition to sustainable urban freight financially feasible.

Box 5: Groningen: Supporting Innovation in Sustainable Urban Logistics¹

Learning from Groningen: Supporting Innovation in Sustainable Urban Logistics

Groningen is taking significant strides to revolutionize its urban logistics landscape through innovative strategies that prioritize sustainability. With an emphasis on reducing congestion, enhancing air quality, and improving overall city liveability, Groningen is implementing a range of initiatives to foster efficient and eco-friendly urban logistics. Notable efforts include:

- **Zero Emission Zones and Smart Exemptions:** Groningen plans zero-emission zones by 2025 and smart exemptions for essential logistics, aligning with EU emission goals.
- **Shared Mobility Solutions:** A shared platform for zero-emission vehicles fosters collaboration among local businesses, curbing emissions and promoting cargo bikes and electric vehicles.
- **Integrated P&R Logistics:** Expanded Park and Ride (P&R) locations integrate parcel pickup and collective services, minimizing delivery vehicles in residential and city areas.
- **Strategic Partnerships:** The Focus Group for Urban Logistics promotes cooperation among businesses, government, and consumers, ensuring solutions meet all stakeholders' needs.
- **National and Regional Collaboration:** Groningen engages in SPES and the Dutch National Climate Agreement, fostering knowledge exchange and united efforts across cities.

Groningen's sustainable logistics commitment, innovative collaborations focus showcases a comprehensive approach, setting an example for greener, more efficient urban logistics worldwide.

1.4 Strategic urban logistics development with stakeholders

Navigating the complex landscape of urban logistics requires a strategic and inclusive approach that extends beyond governance alone. Collaborative development emerges as a keystone: integrating the efforts and expertise of various stakeholders to build resilient, efficient, and sustainable urban logistics systems. This section delves into the pivotal role of institutional collaboration and coordination, the fostering of collaborative business ecosystems, and the active engagement of the public. By harnessing the collective strength of these stakeholders, cities can create comprehensive frameworks that address the multifaceted challenges of urban logistics, while fostering awareness and ownership among residents. This collaborative approach amplifies the impact of policy

¹ ULaADS D5.2, CITY PROFILES: factsheets baseline and city profiles. (2022). <https://ulaads.eu/wp-content/uploads/2022/03/D5.2-ULaADS-factsheets-baseline-and-city-profiles.pdf>

frameworks and regulatory support, paving the way for integrated and harmonious urban logistics operations.

1.4.1 Institutional collaboration and coordination

Within the dynamic landscape of urban logistics, the importance of robust institutional collaboration and coordination cannot be overstated. A pivotal step in this direction involves a comprehensive evaluation of existing institutional frameworks, accompanied by the establishment of a dedicated urban logistics unit. This envisioned unit would play a vital role as a singular point of access for the multifaceted freight and logistics sector. By centralizing various functions and responsibilities, this unit would offer a streamlined platform for information exchange, decision-making processes, and stakeholder engagement. The creation of such a specialized unit has many benefits, primarily, it would pave the way for enhanced coordination among diverse entities within the logistics ecosystem. With a centralized hub for communication and collaboration, the often-complicated web of interactions between governmental bodies, industry players, regulatory agencies, and other stakeholders could be significantly simplified. This simplification translates into faster response times, improved synchronization of efforts, and a heightened ability to collectively address the challenges facing urban logistics. Furthermore, this unit would prove instrumental in propelling the overall performance and productivity of the freight industry. The streamlined access to information and coordinated decision-making would mitigate delays, reduce operational bottlenecks, and optimize resource allocation. As a result, the industry's efficiency would be bolstered, leading to smoother goods movement and a reduction in overall logistical friction.

Of equal significance is the role this specialized unit would play in fostering collaboration not only within governmental bodies but also across the broader spectrum of stakeholders. Close cooperation with industry associations, regulatory bodies, and other relevant organizations would be cultivated, resulting in a shared commitment to implementing sustainable urban freight measures. This collective effort would harness the expertise and insights of all stakeholders, enhancing the feasibility and effectiveness of strategies aimed at improving urban logistics. By serving as a nucleus of coordination and collaboration, this unit holds the potential to transform urban logistics from a collection of disparate actions into a well-coordinated symphony of sustainable and efficient operations.

1.4.2 Fostering collaborative business ecosystems

Within the realm of urban logistics, the establishment of collaborative business ecosystems emerges as a potent strategy that drives efficiency, optimizes resource utilization, and fuels sustainable progress. A key facet of these ecosystems is the introduction of innovative initiatives such as green freight exchange programs and collaborative business opportunities, each contributing significantly to the evolution of urban freight systems.

Green freight exchange programs stand out as transformative platforms that facilitate the efficient movement of goods. These initiatives capitalize on the untapped potential of unused or underutilized

transportation capacity. By connecting businesses with surplus cargo space to those in need of it, these programs effectively counteract the inefficiencies inherent in empty or partially filled vehicles traversing the urban landscape. This innovative approach translates into a reduction in empty travel distances, lowering fuel consumption and emissions, while concurrently optimizing logistics operations. The significance of these collaborative efforts is underscored by their far-reaching impact. Trailer sharing, for instance, is a pragmatic solution that exemplifies resource maximization. Companies possessing excess trailer capacity can forge partnerships with those requiring additional capacity for goods movement. This symbiotic relationship not only reduces the number of underutilized trailers but also alleviates the strain on urban infrastructure by minimizing unnecessary trips. The result is a more streamlined and environmentally responsible urban logistics network.

Moreover, knowledge dissemination endeavours form another cornerstone of fostering collaborative business ecosystems. The sharing of expertise, best practices, and industry insights among businesses fosters a climate of collective learning. This proactive exchange empowers logistics stakeholders with the tools and knowledge required to embrace innovation, optimize routes, and minimize wastage in their operations. Consequently, this knowledge dissemination not only enhances the efficiency of individual businesses but also collectively improves the overall sustainability of urban freight systems.

Fostering collaborative business ecosystems is about harnessing the power of synergy. Through initiatives such as green freight exchange programs and trailer sharing, businesses transform from isolated entities into interconnected partners working toward a common goal: the optimization of urban freight operations. By forging these collaborative links, cities, and regions can capitalize on the cumulative effect of reduced emissions, enhanced efficiency, and heightened economic viability within their urban logistics landscape.

1.4.3 Engagement of the Public and Raising Awareness

Engaging the public and enhancing awareness are critical elements in transitioning toward a more sustainable mobility system. Public engagement could involve campaigns, educational and training initiatives, as well as consultations with stakeholders to establish a collective understanding of the significance of sustainable mobility and to encourage active participation in its development and implementation. Unlike in passenger transport, citizens are indirectly affected by urban freight – for instance, through delivery vehicles obstructing local streets, reallocating on-street parking for freight vehicles, or establishing consolidation centres and mobility hubs near or within residential areas. The question arises regarding key subjects for public involvement and potential starting points for citizen engagement in urban freight. People are primarily interested in receiving undamaged and timely packages or food deliveries. Thus, it could be beneficial to enhance public consciousness about the environmental, social, and economic advantages of sustainable freight alternatives and the adoption of eco-friendly practices.

This communication could occur within a Sustainable Urban Mobility Plan (SUMP) or a dedicated Sustainable Urban Logistics Plan (Sulp) process. Events could be organized to provide citizens with first-hand exposure to sustainable freight solutions, such as guided tours or workshops highlighting environmentally conscious distribution centres and innovative strategies like micro hubs, shared

lockers, collection points, or crowdsourced deliveries, where individuals actively participate in last-mile delivery to nearby recipients or neighbours. Furthermore, workshops on cargo bike operation can effectively encourage people to embrace this sustainable last-mile solution, ensuring they can use it without causing disturbances to others or property. User-friendly mobile apps or digital platforms can play a pivotal role in engaging the public, allowing citizens to track and interact with sustainable freight initiatives in real-time. These app features address users' concerns related to freight, including monitoring the movement of their goods, reporting delivery-related issues, or accessing informative content.



Figure 7: ULaADS Bpost parcel lockers in Mechelen

Through proactive public engagement and heightened awareness, citizens not only contribute to a more environmentally friendly and efficient urban freight system but also reap the benefits of reduced traffic congestion, improved air quality, and enhanced community well-being. This collaborative approach fosters a sense of collective responsibility and ownership, propelling the adoption of sustainable freight practices and making strides toward a more sustainable and liveable urban environment.

Box 6: Global case examples for participation in urban logistics

Public engagement and awareness are key drivers of sustainable urban freight practices. Projects such as CYCLE Logistics in Europe, Seattle's Last Mile project, London's Green Your Delivery campaign, and Tokyo's Green Logistics campaign have effectively increased awareness and engaged interested stakeholders. These projects entailed collaborations with different organizations, including municipal bodies, cycling associations, and logistics enterprises, to foster shifts in behavior, advocate for environmentally conscious delivery approaches, and furnish guidance to individuals and companies. By means of workshops, initiatives, and joint endeavors, these schemes aimed to alleviate traffic congestion, enhance air quality, and optimize the efficiency of final-stage deliveries.

Box 7: Incorporating Collaborative Stakeholders through Local Logistics Fora in ULaADS²

Learning from ULaADS’s Urban Logistics stakeholders Fora methodology

The multi-stakeholder approach within ULaADS’s lighthouse cities – Bremen, Groningen, and Mechelen – fosters collaborative solutions for ULaADS Trials. This strategy involves co-creating solutions and aligning needs with stakeholders via dialogue. The process outlines preoperational steps, ecosystem definition, and stakeholder roles crucial for successful trials. It encompasses stakeholder mapping, local fora, the collective target system, and questionnaires. Local fora, held thrice in each city, play a pivotal role in involving stakeholders. The first forum sets trial parameters based on needs, followed by evaluating goals via a collective target system. An intermediate forum reassesses trials, and the final forum identifies lessons and future prospects.

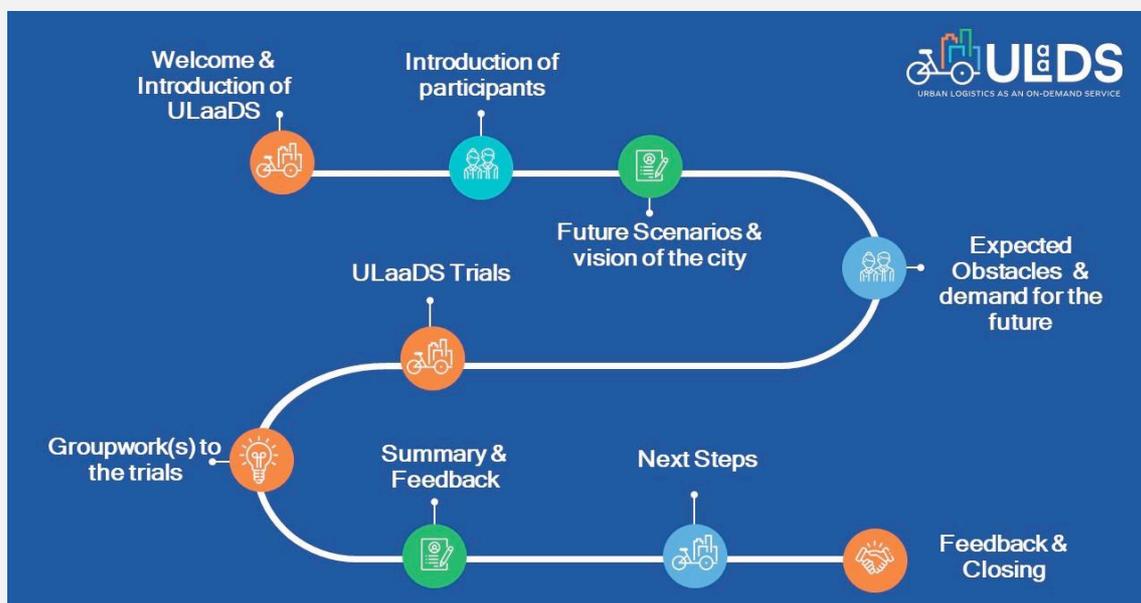


Figure 8: General proposed format of the first local fora for the lighthouse cities in ULaADS Practical adaptations are recognized as valuable for optimal trial preparation, acknowledging differences in city contexts and engagement objectives. The engagement process's effectiveness hinges on striking a balance between stakeholder expectations, time constraints, and willingness to invest effort. Real-world implementation often tests the limits of the general proposed stakeholder ratio. Due to diverse participation levels and varying stakeholder needs, the proposed ratio serves as a benchmark rather than a rigid standard, reflecting the practical nuances of implementation.

² The implementation of a multistakeholder approach in urban logistics. (2021). In ULaADS D2.2. <https://ulaads.eu/wp-content/uploads/2022/01/D2.2-Local-ecosystem-stakeholders-needs-and-requirements-priorisation-of-use-cases-first-version.pdf>

2. The implementation of urban logistics measures

ULaDS's vision is to foster sustainable and liveable cities through the deployment of innovative, shared, zero-emissions logistics while dealing with the impact of the on-demand economy. The core objective of the project is to carry out, expand, and derive insights from inventive trials in on-demand urban logistics. Given the diversity and complexity of urban logistics and its intricate landscape, the execution and evaluation of these approaches need to consider these diverse viewpoints comprehensively and follow the Sulp process. As a result, this chapter focuses on implementing urban logistics measures with respect to the Sulp process. The chapter is divided into four main subchapters delving into crucial topics like necessary legal frameworks, business models, stakeholder involvement, technology utilization, and impact assessment.

2.1 The importance of a proper legal framework

The establishment of a clearly defined legal framework for urban logistics solutions gives a consistent and persuasive message to local authorities and private companies, making it easier for them to make long-term investments. Levelling and shaping the playing field is of paramount importance during the establishment of such infant markets, where risks are high, and competition is fierce.

From the private sector's perspective, a clear and comprehensive legal framework can foster innovation and promote sustainable growth. By establishing a regulatory environment that encourages innovation, logistics companies can develop innovative technologies and services that enhance the efficiency and sustainability of logistics operations. This can lead to increased profitability and job creation, which benefits both the private sector and the economy as a whole.

In addition, a legal framework can provide mechanisms for resolving conflicts between logistics companies and other stakeholders. Conflicts may arise from issues such as noise pollution, traffic congestion, and the use of public spaces. Through the legal framework, stakeholders can work together to mitigate disputes and find solutions that align with public interests.

From the public authority's perspective, a legal framework can help protect public interests by ensuring that on-demand urban logistics activities align with sustainable development goals and public health and safety. For example, regulations around the use of electric vehicles, emissions standards, and the restriction of vehicles in certain areas can promote sustainable development and reduce negative impacts on public health and safety.

An example is Germany, where the Highway Code currently does not provide a clear road sign for loading zones. Although being proposed by the Federal Agency for Highways (BASt) as early as 2007³, only about 15 years later the German Ministry for Transport is developing the change of the Highway Code with a road sign for loading zones. This is one requirement for improving efficiency but as well for reducing conflicts caused by delivery vans being currently double-parked. A low level of enforcement (as given in some member states as Germany) is counterproductive for efficiently applying regulations as loading zones. Only if all players act according to the (same) rules, transport can be organised efficiently.



Figure 9: Draft of a loading/unloading zone for Germany.

Source: BIEK German Association of Parcel and Express Logistics

2.1.1 Experiences and challenges with regulation in the ULaADS trials

In the context of the ULaADS trials, a range of instances has emerged, displaying both successful outcomes and instances where challenges were encountered. These trials have shed light on various aspects of urban logistics implementation. Among the challenges faced, legal hurdles related to the utilization of street space have been apparent. These issues have prompted the need for a deeper examination of regulatory frameworks to facilitate the efficient utilization of public areas for logistics purposes.

Additionally, the collaboration between the trials and enabling public departments has proven pivotal in the initiation and progression of pilot programs. This collaboration has acted as a catalyst for successful trial implementations, underscoring the importance of effective partnerships between

³ See <https://www.biek.de/presse/meldung/biek-startet-initiative-liefern-lieber-in-der-ersten-reihe.html>

public entities and logistics initiatives. Such collaborations have demonstrated the potential to create an environment conducive to the testing and refinement of innovative logistics approaches.

However, it is important to acknowledge that certain ULaADS trials encountered obstacles stemming from the absence of appropriate legal frameworks. In cases where regulatory structures were lacking, the initiation of trial implementation was impeded. This highlights the critical role that well-defined legal frameworks play in fostering an environment conducive to the experimentation and expansion of urban logistics trials.

The City of Mechelen is among the 76 partners that have participated in the inaugural Green Deal, signing in collaboration with the Flemish government and outlining diverse objectives. This cooperative agreement is geared towards boosting the participation of individuals in car-sharing, carpooling, and bicycle-sharing activities. The Green Deal encompasses several initiatives, including the establishment of low-emission zones, the implementation of shared mobility programs, the creation of charging infrastructure, the formulation of an e-mobility strategy, and the integration of citizen science-based traffic monitoring. These measures collectively influence the trajectory of sustainable urban logistics for cities in the future.

Currently, Mechelen is contemplating the formulation of a framework that would permit freight vehicles categorized under European Category L to gain access to restricted zones. Notably, car-sharing platform fleets enjoy unrestricted 24/7 access to these areas. Moreover, there is a reasonable possibility that the car-free zone in Mechelen might undergo an extension in the upcoming years.⁴

Box 8: Harmonisation of urban freight with access regulations⁵

Urban Vehicle Access Regulation - UVARs can be broadly defined as: 'measures to regulate vehicular access to urban infrastructure. It is widely agreed that local or regional Sustainable Urban Mobility Plan (SUMP) serves as the ideal vehicle for UVARs. UVARs aid the promotion of sustainable mobility measures, regulating traffic flows and compliance with air quality legislation, both key SUMP goals. Urban freight traffic is heavily affected by the different policies and technologies applied to regulate access in urban areas.

“The European Commission’s study in 2017 on urban freight included a specific sub-report on UVARs and freight. Stakeholders identified two preferred UVAR schemes for addressing local challenges related to urban logistics: Low Emission Zone (LEZ) and Congestion Charging (CC). The study defined mitigating solutions such as (1) Urban Consolidation Centre (UCC), (2) Cargo bike (CB) and (3) Off-hour deliveries (OHD).

⁴ CITY PROFILES D5.2 ULaADS: factsheets baseline and city profiles. (2022). <https://ulaads.eu/wp-content/uploads/2022/03/D5.2-ULaADS-factsheets-baseline-and-city-profiles.pdf>

⁵ European Commission. (2017). Final Report Study on Urban Vehicle Access Regulations. https://transport.ec.europa.eu/system/files/2017-09/uvar_final_report_august_28.pdf.

- **UCCs** are defined as logistics facility situated in relatively close proximity to the geographic area that it serves (e.g. a city centre, an entire town or a specific site such as a shopping centre complex), to which many logistics companies deliver goods, and from which consolidated deliveries are carried out to businesses within that area. Within the UCC, a range of other value-added logistics and retail services can be provided. The effectiveness of UCCs seems to depend heavily on the presence of appropriate local regulations, including vehicle access rules for the zone covered by the UCC and benefits accorded to UCC operators. Public authorities can put legislation or other regulations into place to promote the use of the system that is being offered. These regulations can be restrictive (requiring or strongly inducing vehicles to use UCC) or founded instead on advantages accorded to users. It should be stressed that this should be linked to dialogue with stakeholders.
- **Cargo bikes** are used for final freight delivery to reduce congestion in cities and are a second mitigating solution for logistics activities in UVAR schemes. Given the advantages (no greenhouse gas emission, low kerbside space, easy to manoeuvre), and disadvantages (limited payload weight, low travel speed) of cargo bikes, it would appear that they are best suited for the distribution of products with a relatively low bulk density and size, and which demand simple storage or handling requirements. Suppliers schedule deliveries to meet the demands of their clients. If the retailers require deliveries during normal working hours, most lorry traffic will occur during the most congested daytime traffic periods. If a critical mass of businesses can adjust their schedules to accept deliveries when there is less traffic congestion, it could enable transport companies to deliver goods more quickly and at lower cost. One of the ULaADS lessons (with demonstrator cities with very bike-friendly environment) is that appropriate infrastructure for cycling and a general mobility culture with respect for cyclists and pedestrians is supportive for developing a high level of using cargo bikes. This includes cycle infrastructure of sufficient width (as cargo bikes may have a width above 1.00 m) and low speed levels (max 30km/h) where cargo bikes will use the lanes in mixed traffic. This could result in less traffic congestion, reduced cost of goods, economic benefits and would be better for the environment. However, Urban deliveries conducted using cargo bikes or powered two-wheelers constitute a minimal portion of the market share. Also, logistics operators seldom consider them as viable solutions when discussing strategies to decrease CO₂ emissions. This lack of enthusiasm toward this mode warrants attention in the development of sustainable urban logistics policies, as it unveils operational complexities that remain only partially comprehended.⁶

⁶ Study on New Mobility Patterns in European Cities. Task B: Targeted Survey on Urban Logistics Final report. (2022). In European Commission. <https://op.europa.eu/en/publication-detail/-/publication/5bfa1938-80e0-11ed-9887-01aa75ed71a1/language-en/format-PDF/source-284584251>

- **Off-hour delivery (OHD)** is therefore a third solution. It is a simple concept, but it can be challenging to implement because the benefits and costs are not always evenly distributed. Carriers generally like the idea because it can save them time and money, but customers often resist it because it can add costs. Communities will benefit from lower congestion but may have concerns about night-time noise. Sometimes, special incentives are needed to encourage businesses to participate, or requirements to mitigate noise disturbance. An OHD programme needs to be designed in a manner that balances the benefits and costs to make it practical for shippers, carriers, customers, and the community.” (Polis 2019)

2.1.2 Active law- and regulation-enforcement

Important for innovation and a clear path towards zero emissions is a clear legal framework with active law- and regulation-enforcement that makes the development of flexible and future-oriented legislations, which otherwise impairs progressive development.⁷ Exemplary is the foundation of the Spanish Sustainable Mobility Law, which has incorporated principles for a digital and innovative transport system,⁸ but just as important as a legislative framework is the rigorous enforcement of existing laws, otherwise it only negatively impacts those who are following the rules.

At present, the White Paper on Transport of the European Commission has established by 2030 the goal of CO₂-free city logistics in major urban nodes, with a population greater than 100,000. If city-access to fossil-fuel-powered freight transport is limited by the existing legal framework, then the introduction of e-freight vehicles is necessary to stay competitive. To facilitate such laborious adaptation, it is necessary to have consistent targets and practices among communities, cities and the EU, so that companies can harmonically adapt to the requirements and make the change an easier process. A common legal framework reduces the time for the companies to reach the necessary economy of scale making de-risk investments possible. Additionally, integrating Sulp into a city's Sump introduces complexity by requiring coordination among diverse stakeholders. However, this complexity aims to enhance efficiency in freight transport. Sulp optimizes routes, schedules, and delivery methods, reducing congestion, cutting delivery times, and minimizing resource waste. While Sulp adoption remains limited, its potential benefits underscore its value in achieving operational efficiency and sustainable urban logistics.

⁷ [Two Urban Logistics solutions for the last-mile delivery problem \(ulaads.eu\)](https://ulaads.eu)

⁸ [LogiSmile: autonomous delivery vehicle Ona showcased in Barcelona | Eltis](#)



Figure 10: ULaADS Groningen's City Centre Logistics Service Platform – Sharing ZE-vehicles.

A practical example of a city that applied a restriction for vehicles is Mechelen, Belgium. Here access to multiple streets has been forbidden for all motorised vehicles. This restriction brought an introduction to change. Therefore, the UFT- companies have started purchasing and using cargo bikes for last-mile deliveries, although according to this article⁹, only 25% of total deliveries can be replaced by bike-based delivery solutions. Nonetheless, this alternative delivery solution should be taken advantage of, as it can reduce traffic jams, pollution, and health hazards that would occur otherwise. However, this approach significantly affects logistics companies in their business operations, as they might have to expand their workforce due to the need for multiple cargo bikes when replacing a single van. Therefore, it is crucial to ensure that formulated solutions are tailored to the specific context's requirements and challenges, recognizing that a universally applicable solution does not exist across all situations. However, if the government officially recognized cycle logistics as a distinct sector, it could incentivize bike-delivery schemes.¹⁰

⁹ [Low and zero-carbon vehicles for urban last-mile deliveries \(ulaads.eu\)](https://ulaads.eu)

¹⁰ [Bike-based solutions in urban logistics - ULaADS - Urban Logistics as an on-Demand Service.](#)

Also, the city of Groningen has applied the last-mile delivery scheme by bike inside the city. Here a mobility hub outside the city centre has been placed at a traffic node, from which commuters can pick up their deliveries from a locker and continue their journey. Similar lockers have been placed in the city centre, yet some unexpected complications have arisen. Some had to be removed as they obstructed the view of security cameras, making the area under surveillance unsafe.

For the entire concept mentioned above, it is important to define clear expectations for data-sharing. Information exchange that is allowed by country and/or European legislation shall be used on its entire potential, adapting to different stakeholders and especially e.g., the city administration easier and more efficiently.¹¹

2.1.3 Conflict management around urban space

Urban street space is a limited resource that needs to accommodate increased space-consuming functions. Besides the classic transport functions of walking, cycling, and driving, the storage of the various vehicles became a role, not only consuming space but also being charged with emotions – thus being politically sensitive. With the increase in the size of cars, we see a decrease in efficiency and growing conflicts.

Street space also needs to serve as a communication space in urban neighbourhoods, as a space for children to play and move safely, as a space with ecological functions. Electric mobility may require on-street charging stations, shared mobility some pick-up and return stations, urban delivery some delivery zones, micro hubs, and parcel lockers.

We face increasing conflicts. As car parking is quite emotional, the implementation of delivery zones may lead to public debates with low support for the needs of urban delivery and related forwarders.

In a holistic strategy, sustainable modes can be supplemented by the support of car sharing – to reduce car ownership in cities with good acceptance of sustainable modes. Still, delivery zones might not be welcomed by the media.

¹¹ [Learning from the Implementation of Urban Logistics Pilots in European Cities: Insights from Domien Stubbe of VIL \(ulaads.eu\)](#)

Box 9: Bremen - Logistics the framework of Sustainable Urban Mobility

Learning from Bremen: Logistics the framework of Sustainable Urban Mobility

Bremen is well recognised for its approach to combine the support for sustainable modes, especially cycling with a policy of promoting car sharing as alternative to car ownership. Results are in overall city liveability and modern mobility patterns. Street space management is a precondition to allow delivery zones in narrow urban neighbourhoods. The consideration of private micro-logistics includes the movement of goods, but as well children instead of using a car by using (shared or privately owned) cargo bikes

Notable efforts include:

- **Promoting car sharing:** For more than 25 years, Bremen promotes car sharing, made it easily accessible by mobility hubs in neighbourhoods.
- **Reducing space consumption for parking :** 80% of the about 30,000 Bremen's car sharers do not own a car. Without car sharing, Bremen would have approx. 8,000 cars more on its streets.
- **Micro-hubs also for heavy goods:** The inner-city micro hubs were established and serve both heavy goods (average above 60 kg) as small express items.
- **Shared cargo bikes for private micro-logistics:** The UlaADS module "Fietje" as shared cargo bikes had positive impacts on mobility patterns. More than 50% of the cargo bike trips replaced car trips.



Figure 11: Pilot project of delivery zone for low emission vans in Bremen – media reaction “car drivers annoyed by eco-parking”.

2.2 Working together with stakeholders on urban logistics measures

Effective stakeholder engagement and cooperation enable multiple parties, including carriers, shippers, customers, and government authorities to work together towards a common goal. Overall transparency can build trust between actors involved and result in an optimized use of resources and infrastructure, leading to more efficient and environmentally sustainable urban logistics processes. Furthermore, stakeholder engagement and cooperation can foster innovation in the logistics industry by identifying and addressing the widest possible range of challenges, leading to faster learning and the development of novel solutions.

2.2.1 From interest to cooperation to ensuring continuous engagement

The ULaADS trials encompass a spectrum of outcomes, both achievements and instructive educative failures. One innovative development within ULaADS involves the establishment of "local urban freight fora," fostering multifaceted discussions among stakeholders. However, challenges in achieving cooperation are evident, with limited synergies among competitors hindering collaboration. The stakeholder landscape's diversity of interests contributes to low commitment to joint efforts. Notably, a city initiated an on-demand logistics task force in response to challenges encountered during ULaADS implementation. Instances of non-compliance with parking regulations and the absence of legal frameworks for loading zones in Germany have led to suboptimal practices, such as vans obstructing lanes, sidewalks, and cycle paths.

Likewise, in Mechelen, stakeholder collaboration encountered challenges arising from the complexities of defining a cooperative framework, particularly in the context of commercial concurrency. In September 2020, a significant milestone was reached as 29 partners endorsed a 'covenant,' committing to actions aimed at achieving a 0% reduction in urban logistics emissions by 2030—a goal aligned with the EU's zero-emission logistics guideline. While the endeavour to gather these partners was marked by dedication and time, the true test now lies in translating these commitments into tangible actions. Ensuring continuous engagement and accountability among all partners remains a pressing challenge for the city.

2.2.2 Pathway to success

It is important to manage a functioning urban logistics system to cooperate between European institutions, national government, and local governments, without excluding civil society and private companies. In this way, the deployment of innovative solutions is a step closer to realisation. Together it is possible to find appropriate space to designate for logistics, as strategic positioning is required to make logistics processes effective, without disrupting traffic flow. Although no stakeholder can confront the challenges of logistics topics on their own¹², sometimes stakeholder cooperation is not considered a benefit. Stakeholders can create contradicting objectives, considering their goals to be the most relevant to be achieved.¹³



Figure 12: ULaADS Cargo bikes in Bremen

It is therefore relevant that stakeholder cooperation and strong stakeholder management are the keys to success. Past experiences prove the possibility of collaboration. Vil is Flanders's innovative leading cluster for logistics that was strongly involved in various trials for the lighthouse cities, such as collecting data and offering support with the upscaling of the trials to the satellite cities. Stakeholders and the Government shall come together to better understand what benefits ULaADS can bring to logistics improvement¹⁴. Stakeholders, therefore, must be taken on board before any final project proposal, to define everyone's expectations, taking into consideration that unexpected complications can occur within the stakeholder group or the socio-economic reality. Stakeholder

¹² [ULaADS \[only RC\] - POLIS ALICE Guide-Zero-Emission-Urban-Logistics Dec2021-low.pdf - Alle Dokumente \(sharepoint.com\)](#)

¹³ [Two Urban Logistics solutions for the last-mile delivery problem \(ulaads.eu\)](#)

¹⁴ [Data-driven decision support tools for Urban Freight Transport \(UFT\) planning \(ulaads.eu\)](#)

participation is always dependent on the local needs of a community i.e. a city¹⁵. Recognizing that residents and end consumers form the central pillars of the urban logistics stakeholder's system, it is crucial to involve them in the assessment procedure and to consider their input, suggestions, and concerns. Following this, the city of Rome, for example, introduced a survey for all Romans to express their ideas about what changes need to be implemented to guarantee a better transportation and living experience in the Italian capital. Evaluation of the response and the coming steps to create a SUMP for the population were disrupted by the COVID-19 pandemic¹⁶

2.2.3 The development of a business model

Urban Freight Transport (UFT) operates as a profit-driven endeavour closely linked with policies and infrastructure that fall within the sphere of public goods. This collaboration with public authorities often introduces challenges related to potential market interference. To address these challenges, solutions like white-label approaches can provide a reliable means of mitigating tensions over the long term. White-label approaches introduce complexities involving legal and contractual factors, quality control, differentiation, manufacturer dependency, long-term sustainability, and the necessity for robust branding and customer support. Nevertheless, successful implementations have been witnessed in sectors such as bike sharing.

Furthermore, innovative solutions tested within the ULaADS project, such as cargo hitching, complicate the traditional distinction between public transportation (typically publicly funded) and parcel deliveries (usually privately funded). Striking a balance that aligns with both public and private interests is crucial to ensure the sustainable growth of on-demand urban logistics in harmony with overarching public policy objectives. Practical problems and potential disadvantages for passengers need to be considered, such as time required for loading and unloading, space requirements for goods at public transport stops etc.

In the context of developing business models for urban freight, a series of challenges come to the forefront. Central to these challenges is the inquiry into the role that governments should assume in this arena. Questions include: What forms of regulation should be put in place? Should governmental support to take the shape of allocating space, providing subsidies, or other measures? Public transport often has privileges like bus lanes or traffic light priority. If there is cooperation of public transport companies with some forwarders, we face unfair competition. The same applies to public transport subsidies. It is worth noting that the logistics sector is often perceived as a private enterprise, leading to potential hurdles in garnering public and political acceptance of governmental support. Conversely, when the government offers non-monetary support, such as access to public spaces, it may lead solution providers to expect such provisions without financial implications. This

[15 Learning from the Implementation of Urban Logistics Pilots in European Cities: Insights from Domien Stubbe of VIL \(ulaads.eu\)](#)

[16 Giving people what they want: Rome's SUMP and its participatory co-creation process | Eltis.](#)

dynamic highlight an implicit expectation within the private sector that local authorities should extend support without a corresponding financial commitment.

In conclusion, the ULaADS trials offer insights into the intricate relationship between innovative urban logistics solutions and the principles of Sustainable Urban Logistic Plans (SULPs). These trials demonstrate diverse strategies to address urban logistics challenges while striving for economic viability and environmental sustainability. SULPs, which are built on principles of strategic planning, stakeholder engagement, and integrated policies, find resonance in the approaches explored within the trials. From cargo bike schemes that emphasize community engagement to parcel locker solutions integrated into established business models, the trials underscore the necessity of tailoring solutions to the specific urban context, fostering collaboration among stakeholders, and considering the roles of funding, incentives, and regulations. These trials follow the core principles of SULPs, highlighting the need for integrated solutions that navigate urban logistics complexities towards a sustainable future.

2.2.4 The diversity of business models in ULaADS

The examples derived from the ULaADS trials provide valuable insights into both successful outcomes and instances of failure. These trials encompass a diverse range of business models and solutions tailored for varying applications within the urban logistics landscape. For instance, the cargo bike scheme trialled in Bremen does not adhere to a traditional business model framework, nor is it actively seeking one. Instead, these solutions rely on initial funding and subsidies, aiming to achieve self-sustainability through community and user support. On a similar note, the shared vehicle scheme piloted in Groningen may possess elements of a business model, yet the primary objective of the trial is to dissect these components and gain insight into the conditions necessary for a feasible business model.

In contrast, some solutions, such as the implementation of parcel lockers, have already established robust business models in specific contexts, such as the case of Bpost in Mechelen. The ULaADS trial in Groningen seeks to explore whether a solid business model can be achieved with a white-label solution, while also investigating the potential influence of local government on the locker's placement.

Across these trials, a common theme is the reliance on project funds to varying degrees. In Bergen, providers have explored diversification strategies to fortify their business models. In the case of Bremen's Rytte containerized last mile trial, a potential path forward involves increased city involvement through incentives and regulations. The role of governmental support, funding, and subsidies emerges as a pivotal factor, with considerations about the trial's viability and the potential impact of zero-emission zones, as observed in Mechelen, adding to the complexity. The AV trial in Mechelen not only yields insights into value proposition but also sparks discussions about necessary legislative changes at the national level.

2.2.5 Deep insights into the role of costs and prices

Several crucial insights and success factors have emerged from the implementation of urban logistics pilots in European cities, as highlighted by the ULaADS program:

Market Creation through Business Model Replication

One notable outcome is the replication of successful business models trailed within ULaADS by other companies. This phenomenon not only demonstrates the viability of these models but also contributes to market creation, fostering innovation and competition within the urban logistics sector.

Defining Clear Trial Expectations

A fundamental lesson is the significance of defining clear expectations for each trial. Establishing a comprehensive understanding of trial objectives, outcomes, and parameters ensures that stakeholders are aligned and can assess success accurately.

Navigating Unforeseen Challenges

Unanticipated complications, such as the disruptive impact of the COVID-19 pandemic, can reshape planned business models. An example from Groningen illustrates how a main trial partner's bankruptcy during the pandemic necessitated creative workarounds to uphold the business model amidst a global state of emergency.¹⁷

Cost Considerations and Standardization

Cost plays a pivotal role in shaping logistics concepts. The inclusion of manual labour, expansion of the workforce, and the absence of standardization in technology, services, or processes can lead to increased delivery unit costs. This economic aspect is crucial as stakeholders, including end customers, strive to minimize costs when utilizing logistics services.¹⁸

Diverse Business Model Examples

Several distinct business models have emerged within the ULaADS program, addressing various urban logistics challenges:

- The LogiSmile "Ona" autonomous delivery vehicle in Esplugues de Llobregat employs autonomous last-mile delivery robots to alleviate noise and air pollution while ensuring safety for pedestrians, cyclists, and couriers.¹⁹
- The City of Paris and the 15th arrondissement employ the local on-demand logistic platform "Stuart" for same-day, scheduled appointment-based bike rider deliveries from mobile hubs to end customers.²⁰

¹⁷ [Learning from the Implementation of Urban Logistics Pilots in European Cities: Insights from Domien Stubbe of VIL \(ulaads.eu\)](#)

¹⁸ [Two Urban Logistics solutions for the last-mile delivery problem \(ulaads.eu\).](#)

¹⁹ [LogiSmile: autonomous delivery vehicle Ona showcased in Barcelona | Eltis](#)

²⁰ [Stuart teste un entrepôt mobile à Paris - Prestataire Logistique > Logistique - EcommerceMag.fr](#)

- Swiss CST's innovative business model aims to mitigate the strain on above-ground street infrastructure in Switzerland by establishing an automated underground transportation system connecting the entire country.²¹

These examples address the escalating demands on road networks and traffic congestion. An alternative approach involves distributing deliveries across flexible hours, thereby easing congestion during off-peak periods. However, challenges like noise pollution and societal costs associated with extended working hours need to be balanced against the goal of minimizing prices for consumers.

In conclusion, the pursuit of competitive pricing, public acceptance, worker welfare, and safety remains a complex endeavour in the realm of urban logistics, as evidenced by the insights gleaned from the ULaADS program.²²

2.3 Looking for the right technology and innovation

The section delves into the rationale and significance of innovation and technology in urban logistics, highlighting several pivotal aspects shaping it. E-mobility, a cornerstone of modern transportation, offers an avenue for reducing emissions and enhancing sustainability and operations in urban logistics. The adoption of electric vehicles and other eco-friendly modes of transport not only contributes to cleaner air quality but also aligns with broader environmental objectives. Automation, another critical facet, promises increased efficiency and precision in last-mile deliveries. The integration of automated systems and robotics streamlines operations optimizes route planning, and reduces human error, enhancing the overall performance of urban logistics networks. Additionally, the concept of the Physical Internet introduces a paradigm shift in how goods are transported and distributed, advocating for a standardized, interconnected approach to logistics. This model aims to enhance route optimization, and resource utilization, minimize waste, and create a more resilient and adaptable supply chain ecosystem. In summary, the confluence of e-mobility, automation, and the principle of the Physical Internet underscores the imperative of redefining urban logistics to address contemporary challenges while forging a sustainable and efficient future.

2.3.1 Digitalisation and new technologies. Essential but challenging

The ULaADS trials offer valuable insights, encompassing both achievements and setbacks.

The second trial in Mechelen centered around cargo hitching alongside an autonomous vehicle. As the project progressed, an opportunity emerged to collaborate with the European project ART-Forum, expanding the scope and impact. This collaboration facilitated a successful test of an autonomous vehicle transporting both individuals and packages within a business park in the summer

²¹ Sustainable end-to-end transport system Switzerland (cst.ch)

²² ULaADS [only RC] - POLIS ALICE Guide-Zero-Emission-Urban-Logistics Dec2021-low.pdf - Alle Dokumente (sharepoint.com)

of 2022. The trial provided valuable insights and explored potential future business models. Despite the significant insights gained, it became apparent that fully implementing autonomous vehicles for city logistics, especially within a cargo hitching framework, might not yet be feasible given the current state of technology²³

Additionally, ULaADS solutions in Groningen trials involved the development, execution, and promotion of a platform facilitating on-demand supply and delivery between shops and consumers within the city. The platform idea was to offer shared zero-emission vehicles accessible at various city locations, integrating mobility networks, location sharing, and vehicle sharing. Local entrepreneurs can utilize these vehicles for shop supplies and customer deliveries, including coordination of deliveries to parcel lockers at mobility hubs, offices, and more. This approach aligns with collaborative delivery models, integrated urban freight management, and efficient mobility networks. However, attempts to create comprehensive app or platform solutions for ULaADS services within specific cities or regions encountered challenges, hindering user adoption.²⁴

Addressing a related issue, the implementation of car-free zones in Mechelen was accompanied by stringent regulations. To ensure compliance, Automatic Number Plate Recognition (ANPR) cameras operate, scrutinizing vehicle entries and imposing fines on unauthorized vehicles accessing these zones. This system highlights the significance of regulatory mechanisms in enforcing urban logistics measures.²⁵

²³ Learning from the Implementation of Urban Logistics Pilots in European Cities: Insights from Domien Stubbe of VIL. ULaADS - Urban Logistics as an on-Demand Service (2023, April 18).. <https://ulaads.eu/learning-from-the-implementation-of-urban-logistics-pilots-in-european-cities-insights-from-domien-stubbe-of-vil/>

²⁴ Business and operating models in ULaADS trials. ULaADS D3.3. (2022). https://ulaads.eu/wp-content/uploads/2022/07/ULaADS_DeliverableD3.3_final-.pdf

²⁵ City Profiles ULaADS D5.2: factsheets baseline and city profiles. (2022). <https://ulaads.eu/wp-content/uploads/2022/03/D5.2-ULaADS-factsheets-baseline-and-city-profiles.pdf>

Box 10: Consolidation Centers & Micro hubs

Consolidation centers

Consolidation centers serve as central hubs of considerable size that are responsible for the consolidation and sorting of products originating from multiple suppliers or distribution centers. Positioned strategically within city limits or at their peripheries, these centers enable efficient distribution and transportation. By collecting shipments from diverse origins and consolidating them into larger loads, consolidation centers promote environmentally friendly and cost-efficient transportation. They play a vital role in orchestrating both incoming and outgoing logistics operations, encompassing tasks like sorting, cross-docking, and temporary storage.

Micro hubs:

Micro hubs are compact distribution facilities positioned strategically within urban areas. They act as intermediary points, bridging the gap between more extensive distribution centers or terminals and the ultimate delivery endpoints. Micro hubs are responsible for consolidating goods, facilitating swift transfers between vehicles, and managing temporary storage and inventory. These hubs are adaptable to various transportation methods and incorporate technological advancements to optimize their functioning.

■ **Logistics is coming to town**

Over the past few decades, significant shifts in consumer behaviour, particularly the surge in e-commerce, have reshaped commercial patterns. Due to the increase in freight volume and urban traffic several strategies for a better organisation of urban freight have emerged:

Urban Consolidation Centres (UCC): These logistics facilities operate as transshipment points, mitigating traffic and congestion by removing large freight vehicles from city streets. Freight from various delivery companies is consolidated at these centres outside the city, then sorted and transported to micro hubs within the urban core. Last-mile deliveries to end customers are often executed using low-emission vehicles like cargo bikes.

Micro Hubs: Cities like Mechelen and Groningen have implemented micro hubs, such as the mobility hub in Hoogkerk. These hubs, situated at a distance from the city centre, allow commuters to pick up parcels on their way home. Challenges encountered during implementation, such as security concerns due to obstructed cameras, highlight the complexities of integrating such solutions.

Urban Warehouses / Logistic hotels: In Paris' 15th Arrondissement, Stuart's urban warehouse occupies an existing space within the city, reducing land artificialization and its environmental impact. This approach optimizes the use of limited urban space while offering proximity to end customers.

These developments have also led to the introduction of new types of "light" freight traffic, including cargo bikes, scooters, and vans for last-mile and metre functions.

Cargo Bikes: Cargo bikes have gained traction due to their lower maintenance and purchase costs, coupled with health benefits for riders and environmental advantages. However, the suitability of cargo bikes for freight delivery hinges on factors like road surface, frequency of delivery, and cargo



Figure 13: ULaADS Containerized last-mile delivery – heavy-load cargo bikes in Bremen.

weight. Alternatives, such as attaching trailers to regular bikes, have been explored to address cargo bikes' limitations.

Alternative Vehicles: In cases where cargo bikes are not feasible, other zero-emission vehicles offer an alternative. Affordability is a key consideration, with tax cuts or incentives potentially encouraging investment in new vehicles. Concurrently, road infrastructure must evolve to accommodate new vehicle technologies.

Underground Logistics: A forward-looking logistics system is taking shape underground in Switzerland, with the development of Cargo sous Terrain. This fully automated freight transportation system operates in tunnels, allowing continuous, high-speed transportation of goods. Even perishable items can be transported in refrigerated modular containers.

2.4 Generating impact: Data, indicators and monitoring

Data standards and sharing play a critical role in on-demand urban logistics due to their potential to enhance operational efficiency, stakeholder integration, transparency, and innovation. Through the establishment of a standardized language for data exchange, logistics companies can reduce the resources required to process and analyse data, allowing for faster and more informed decision-making. Furthermore, data sharing can facilitate the integration of various stakeholders by enabling seamless data exchange between different systems and platforms. This increased transparency in the logistics industry can enhance customer visibility and control over deliveries, building trust in the process. Finally, data standards and sharing can drive innovation by enabling the development of new services and products. This common framework for data exchange allows for more effective collaboration between companies, leading to new solutions that improve the efficiency and effectiveness of on-demand logistics. Overall, data standards and sharing are vital to the success of on-demand urban logistics, providing the foundation for the growth and development of the industry.

2.4.1 Creating common data sets

The ULaaS trials have been a source of both successes and failures, offering valuable insights into the dynamics of urban logistics. Notably, in cities like Bremen and Groningen, the introduction of continuous customer experience surveys within the context of cargo bikes and shared electric vans for local shops has generated substantial and meaningful data. This information has contributed to understanding the preferences and needs of customers in these specific urban settings. However, a critical challenge that emerges is the lack of a common baseline across these trials. The absence of a standardized framework makes it difficult to compare and analyse data from different trials effectively. Consequently, achieving a comprehensive understanding of the collective impact of these trials becomes a complex task. Despite this challenge, the data collected from various trials still serve as valuable touchpoints for refining and optimizing urban logistics strategies.

Some of the challenges faced by ULaaS cities included concerns on data sharing, lack of information, extensive data collection exercises and additional work such as interview, proxies, assumptions, and others. Indeed, gathering the necessary data was a real challenge to overcome throughout the pilot implementation. In some cases, the level of data gathered, for instance, number of trips, kms travelled, time related to loading, unloading, travelling, etc., did not correspond to the needs and objectives for the specific case. A clear determination of Key Performance Indicators (KPIs) was also crucial to ensure clarity of the scope of the data needed, and particularly of the data that is not required²⁶.

“In the project timeline, the focus was on defining the key performance indicators (KPIs) and linked data required from trial partners. This process resulted in an extensive longlist, essentially a 'wish list' of potential data sources. However, the partners were hesitant to provide data without assurance that it aligned with their project roles. Consequently, the approach was revised. Each partner individually collaborated to collect meaningful data, marking an intense effort led by responsible partners Fraunhofer from Germany and the Transport Economic Institute from Norway. Additionally, stakeholder fora, organized by cities with support from the Austria-based knowledge institute IFZ, adapted their initial theoretical concepts to explore practical possibilities within city and stakeholder contexts. Throughout the project, participants demonstrated remarkable flexibility and dedication to ensure its successful completion. Nevertheless, the project had to undergo a complete turnaround from the initial proposal plans”²⁷.

The lessons learned through ULaaS demonstrated that flexibility and proactivity to react and adapt the approaches for the data collection and analysis for each specific case did play in favour of the project. Considering the specificities of the local context, as well as the effort needed is crucial on this matter and should be taken into account in current and future trials.

²⁶ Insights from the ULaaS workshop at the GAM October 2022.

²⁷ Interview to Domien Stubbe (VIL). Learning from the implementation of Urban Logistics Pilots in European Cities: Insights. Retrieved from ULaaS website.

2.4.2 The power of data exchange and monitoring

In the exploration of lessons learned and success factors, a diverse range of challenges and solutions emerged across the lighthouse cities. Each city encountered its distinct set of difficulties, and correspondingly, they devised unique strategies to address them effectively²⁸. Due to the nature of urban logistics led by many private parties, some partners were not willing to share most KPIs listed. In general, data should be transparent and accessible among partners, which is sometimes not the case²⁹.

Some interesting solutions include the conduction of interviews for data collection, mainly for qualitative information and the use of monitoring tools. Cameras, sensors and enforcement tools could support on the monitoring taking the necessary precautions on the privacy issues. Regulation can also be applied to support the monitoring task in a more strategic way³⁰.

The need for adaptability became evident, as changes in regulations, laws, and customer behaviour could significantly reshape the urban logistics landscape. Regulatory shifts introduce new dynamics that the ULaADS program must navigate, while changes in consumer preferences can trigger shifts in demand for e-commerce infrastructure³¹. Demonstrating the power of data exchange, the trials highlighted the potential for streamlined communication among stakeholders, leading to efficient resource allocation and timesaving. This dynamic interplay between challenges, adaptation, and collaborative data-sharing underpins the evolving nature of urban logistics in response to ever-changing urban contexts³².

2.4.3 The impact of ULaADS trials

The potential for ULaADS trials to evolve into sustainable initiatives beyond the project's duration varies for each trial. Mechelen, as previously mentioned, took a bold step by experimenting with highly innovative and complex setups; however, these trials are not yet prepared for actual implementation. In the case of Bremen, since the trials were already in progress, there is a promising outlook for their continuation and possible adoption by other cities. In Groningen, the trial involving shared logistic vehicles has a strong likelihood of persisting, although challenges may arise once financial support concludes. It will be crucial to collaboratively define a practical business model with stakeholders to ensure seamless integration and long-term adoption³³.

²⁸ <https://ulaads.eu/learning-from-the-implementation-of-urban-logistics-pilots-in-european-cities-insights-from-domien-stubbe-of-vil/>

²⁹ Insights from the ULaADS Workshop at the GAM October 2022

³⁰ Idem

³¹ <https://ulaads.eu/two-urban-logistics-solutions-for-the-last-mile-delivery-problem/>

³² [Giving people what they want: Rome's SUMP and its participatory co-creation process | Eltis](#)

³³ Interview to Domien Stubbe (VIL). Learning from the implementation of Urban Logistics Pilots in European Cities: Insights. Retrieved from ULaADS website.

The impact level on a specific trial would of course depend on the scale of the assessment, for instance, a solution might have low impact at a city scale; however, a high impact at a trial scale. More importantly than the measured impact of a particular trial, is the experience and learning along piloting a new solution in a real environment where the value is. Through the ULaADS trial cities and partners learned what works and does not work on a specific context considering the specific local landscape where the solution is placed. The learning achieved is unvaluable and will certainly drive further innovations in the years to come.

In conclusion, the lessons learnt can be summarized in the following points:

- The significance of a robust participation platform involving stakeholders is crucial for the successful implementation of sustainable innovation, not only within a specific project but also in the broader context of city logistics.
- Involving citizens through surveys, proved vital for identifying critical mobility improvements required for successful urban logistics implementation.
- It is essential to establish explicit and detailed expectations, putting them in written form.
- Clear guidelines are necessary for data sharing, areas of collaboration, expectations regarding participation in meetings, and dedicated work hours, all of which should be clearly defined in advance.
- Each lighthouse city faced unique difficulties, necessitating bespoke solutions.
- ULaADS cities demonstrated flexibility in responding to alterations in regulations and laws that reshape the urban logistics landscape.
- Upholding commitments made several years ago can be challenging, especially when priorities or circumstances shift. Therefore, it is essential to minimize the time gap between agreements made during trials and the commencement of actual work.
- It is vital to recognize that if circumstances change, the rules governing the situation will also undergo modifications.
- Changes in consumer preferences for e-commerce infrastructure and services have the potential to drive shifts in demand, influencing logistics strategies.
- The trials underscored the efficiency of data sharing among stakeholders, enabling effective communication, resource allocation, and timesaving.

This iterative process of addressing challenges, adapting to evolving circumstances, and collaboratively harnessing data insights defines the essence of successful urban logistics in a constantly changing urban environment.

3. Setting the scene for urban logistics implementation through Sulp

In recent years, extensive experience has been gained with the Sump concept in different countries and contexts. Overall, many Sumps of the new generation are based on similar methods and measures. Examples include improvements in the structural conditions of the network and services for public transport, cycling and walking, making it more difficult to use cars and making better use of existing infrastructures instead of new construction. In the Sump process, for example, the involvement of politicians and stakeholders together with a more dialogue-oriented participation of citizens has proven positive. Guidelines from higher planning levels are often an important incentive for effective planning and implementation. Even if there are still methodological challenges in the preparation of the plan, and more importantly numerous implementation problems Sump is mainstream in Europe and beyond.

The experience with Sulp is less extensive. Due to the increasing importance of urban logistics both for the functioning of urban transport and for the sustainability efforts of cities and regions, the topic is receiving increasing attention within the framework of Sump, less through singular Sulp but more through isolated projects. These are, for example, efforts and approaches by municipalities to better bundle the activities of individual logistics companies and to make space available for logistical uses. Further problem is the dynamic development in the delivery market – not only technology development and its impacts are hard to forecast, also societal developments on the consumer side as on the business side with emerging and disappearing market players.

What also makes Sump i.e., Sulp so attractive for urban logistics, at least for the public sector, is its strategy and goal-oriented approach to action planning with a consequent focus on the monitoring of the progress. The public sector has a common orientation on well-being that needs to consider the requirements and goals of higher planning levels as well as the interests of all stakeholders and citizens. A local or regional Sump process should therefore also address key parameters for urban logistics or analyse the impact of urban mobility policies on the accessibility and organization of commercial transport. This entails that economic actors should be integrated or consulted in the Sump, which is already commonly done through the participation of chambers of commerce and trades and others.

However, there are also major differences or special characteristics to which a planning process for urban logistics must react or adapt. These are on the one hand the economic dynamics and on the other hand the market processes and actors to which the process must react. A top-down approach is excluded but must be flexible and able to react to innovation. Also, the role of citizens is different. There is a rather indirect concern about other forms of delivery of goods or about the reservation of urban space for logistical activities in my neighbourhood. Nevertheless, it is important that there is an awareness among the population of the concerns for the delivery and functionality of the city and districts and that there is support in the efforts and policies to make logistics more sustainable.

The main findings of ULaADS contributing to a more comprehensive and collaborative approach for urban logistics are presented in the following chapters:

3.1 Fostering flexibility and resilience in dynamic urban logistics

In the intricate realm of urban logistics, it's essential to acknowledge the ever evolving and dynamic nature of this field. Urban logistics, being deeply intertwined with technological advances, is subject to constant and transformative influences that shape its path. These influences encompass the ever-changing landscape of technology, the changing prominence of major stakeholders, and the unforeseen external factors, including global events such as the COVID-19 pandemic. This intricate web of variables has the potential to swiftly and significantly impact the logistics industry, underscoring the critical need for a dynamic and adaptable approach within SULPs.

In today's fast-paced world, the urban environment is constantly in change. Populations grow, economic activities shift, and technological innovations emerge with remarkable speed. These changes have a direct impact on how goods and services move within cities.

Rather than being static documents, SULPs should be conceived as living and evolving strategies that can readily accommodate the shifting landscape of urban logistics. The importance of flexibility as a cornerstone of enduring success in urban logistics cannot be emphasized enough. The very essence of urban logistics hinges on its ability to swiftly adapt to the ever-changing demands and challenges that arise.

Technological advancements continually redefine the landscape of logistics. For example, the rise of e-commerce has revolutionized the way products are delivered to consumers, leading to a surge in last-mile deliveries and the need for more efficient and sustainable transportation methods.

Moreover, major stakeholders in urban logistics, including logistics companies, local governments, and consumers, play a pivotal role in shaping the industry's trajectory and the ascent or decline of major stakeholders can swiftly reshape the industry's dynamics. Also, the preferences and expectations of consumers can change rapidly, influencing the demand for faster, more convenient, and eco-friendly delivery options. Government regulations and incentives can also have a profound effect on the industry, promoting practices that reduce congestion and emissions, leading to logistics companies constantly innovating to meet these evolving demands.

As these transformative forces exert their influence, SULPs should serve as the framework that empowers cities to navigate these changes effectively, ensuring that their urban logistics systems remain agile and capable of thriving amid evolving circumstances.

Amid these ongoing transformations, the COVID-19 pandemic demonstrated the vulnerability of urban logistics systems to unforeseen external shocks. Lockdowns, supply chain disruptions, and the increased demand for essential goods exposed the need for resilient and adaptable logistics strategies. Sustainable Urban Logistics Plans, as living documents, can help cities navigate through

such crises by allowing for swift adjustments and resource allocation to meet the urgent demands of their communities.

In conclusion, urban logistics is a dynamic and ever-changing field, deeply influenced by technological advances, stakeholder dynamics, and unforeseen external factors. As cities grapple with the evolving demands of urban life, SULPs serve as the cornerstone of adaptability and resilience, ensuring that logistics systems can thrive amidst the intricate web of variables that define urban logistics in the 21st century.

3.2 Inclusive stakeholder engagement

To create SULPs that effectively address the multifaceted challenges of contemporary urban logistics, cities should emphasize the importance of inclusive stakeholder engagement. This participatory approach should involve a diverse array of stakeholders, including representatives from public authorities, logistics service providers, businesses, subject matter experts, and other relevant parties. Utilizing a range of engagement strategies, including the highly effective local stakeholder fora employed during ULaADS trials, collaborative target-setting mechanisms, and online surveys, cities can foster an environment of collective decision-making and information sharing.

This inclusive and collaborative approach to stakeholder engagement in the Sulp development process serves two pivotal purposes. Firstly, it facilitates the fine-tuning of logistics trials. By actively involving stakeholders from the outset, cities can gather real-world feedback and insights, enabling adjustments and refinements to be made during the planning and trial phases. This iterative process not only enhances the effectiveness of logistics trials but also contributes to more sustainable and adaptable long-term solutions. Additionally, it helps to build consensus and acceptance among the various stakeholders, which is vital for the successful implementation of proposed logistics solutions.

Secondly, this inclusive engagement methodology extends to understanding the needs of the business community. Close collaboration with businesses provides invaluable insights into their specific requirements for economically sustainable logistics solutions. Recognizing and addressing the unique demands of different industries and sectors is essential for tailoring SULPs to ensure that they effectively meet the diverse logistical needs of the urban landscape. Moreover, a comprehensive understanding of business needs promotes the development of logistics solutions that are not only efficient but also economically viable, which is crucial for the overall success of SULPs.

In ULaADS, stakeholder engagement played a pivotal role in with the three lighthouse cities actively exchanging their challenges and solutions with potential implementation partners. These partners included representatives from public authorities, logistics service providers, retailers, experts, and other pertinent stakeholders. The primary methods for involving stakeholders included hosting local stakeholder forums, applying the collective target system, and conducting online surveys.

This approach yielded dual advantages. Firstly, it fine-tuned the trial initiatives to enhance long-term outcomes and garner broader acceptance. Secondly, it deepened the comprehension of the business community's requirements for economically sustainable solutions.

In summary, the process of developing SULPs benefits significantly from inclusive stakeholder engagement, as it allows for a more informed and collaborative approach to addressing the complex logistics challenges faced by modern cities. This approach not only fine-tunes logistics trials but also ensures that SULPs are tailored to meet the distinct requirements of various industries, ultimately contributing to more sustainable and economically viable urban logistics solutions.

3.3 Encouraging technological innovation and data driven approaches

The dynamic field of urban logistics is indistinguishably tied to technological innovation and data collection, ushering in a new era of efficiency, sustainability, and adaptability. In today's fast-paced world, the urban environment is subject to constant change, driven by technological advancements that revolutionize how goods and services move within cities.

Urban logistics, once a domain reliant on traditional methods, is undergoing a transformative shift, driven by technological innovation. The rise of e-commerce has disrupted traditional supply chains, leading to the spread of last-mile deliveries and the need for more efficient transportation methods. Innovative solutions like electric vehicles, autonomous delivery robots, and drones are becoming visible, offering a glimpse into the future of urban logistics.

Central to this technological evolution is the vast amount of data generated by urban logistics operations. Data collection and analysis have emerged as essential tools for urban planners, logistics companies, and local governments to make informed decisions. Real-time tracking, route optimization, and predictive analytics are just a few examples of how data-driven approaches are enhancing the efficiency and reliability of urban logistics. By harnessing the power of data, stakeholders can minimize delivery times, reduce fuel consumption, and mitigate the environmental impact of logistics operations.

SULPs serve as the framework that empowers cities to navigate the rapidly changing landscape of technology in urban logistics. Rather than static documents, SULPs are designed to evolve in tandem with technological advancements, ensuring that urban logistics systems remain agile and adaptable. These plans can incorporate strategies for integrating new technologies into existing logistics operations and provide guidance on implementing data collection and analysis practices.

In urban logistics, technology innovation and data collection are driving forces that are reshaping the way goods and services are delivered within cities. Embracing technological advancements and adopting data-driven approaches are essential for building more efficient, sustainable, and adaptable logistics systems. SULPs serve as the blueprint for cities to navigate this ever-changing landscape, ensuring that their urban logistics operations remain agile and well-prepared for the challenges and opportunities that lie ahead. As technology continues to advance, cities that harness its potential will be better equipped to meet the evolving demands of urban life while contributing to a more sustainable and resilient future.

3.4 Optimized space allocation and regulation

Creating a cohesive and effective regulatory framework for urban logistics is a multifaceted challenge, primarily due to the industry's diverse nature. In contrast to passenger transport, freight logistics encompass a wide array of players, ranging from nimble local startups to established global industry giants. As urban landscapes evolve, regulations must adapt to strike a delicate balance that caters to the complex needs of the sector.

Firstly, the establishment of a fair regulatory framework is vital. The regulatory framework should actively foster fairness and trust within the freight logistics industry. Fairness and trust are critical components of cooperation and collaboration, which are essential for driving industry-wide innovation and ensuring the sustainability of the sector. Initiatives that promote trust-building, such as public-private partnerships and collaborative research projects, can serve as invaluable platforms for industry stakeholders to come together, share insights, and work jointly towards common goals, especially in the context of sustainable practices.

Secondly, the thorough and unwavering enforcement of regulations is fundamental for proficient urban logistics management. Regulatory enforcement is crucial in maintaining the seamless operation of various logistical aspects within city environments. Barcelona stands as a prime example of the far-reaching impact of rigorous regulation enforcement on the urban landscape.

The strict enforcement of regulations is crucial in safeguarding optimized space allocation. Applying efficient utilization of storage facilities and dedicated loading and unloading zones, the lifeblood of urban logistics, ensures the punctual delivery of goods, reducing congestion and streamlining the logistical process. By implementing rigorous monitoring and imposing substantial fines for infractions, cities can deter illegal parking and unauthorized zone use. These regulations incentivize compliance by making non-adherence economically unattractive, thus preserving the integrity of the logistics network and facilitating uninterrupted goods flow while minimizing disruptions.

This has a ripple effect on overall traffic management within urban areas. By minimizing disruptions, the regulatory approach promotes efficient and unhindered traffic flow throughout the city. This, in turn, enhances the operation of the broader urban transportation system, leading to reduced congestion, and shorter commutes. This plays a pivotal role in enhancing the overall accessibility and liveability of urban environments by ensuring that space is used effectively for the benefit of residents, businesses, and the environment. As urban areas continue to evolve, optimized space allocation remains a critical focus for regulators, logistics providers, and city planners seeking to create sustainable and thriving cities.

In conclusion, the ongoing challenge of striking a balance between regulatory oversight and industry autonomy, particularly in the dynamic freight logistics sector, necessitates adaptable, responsive, and forward-thinking regulations that can accommodate a diverse range of stakeholders and evolving urban and global demands. Effective regulation in the freight movement sector should not only protect the interests of businesses and consumers but also foster optimized space allocation. The proactive regulation enforcement will not only mitigate congestion and optimize the flow of goods but also contribute to the creation of more accessible, sustainable, and livable urban environments.

3.5 Ensuring fair competition in logistics

Ensuring fair competition in the logistics sector is a fundamental aspect of creating a balanced regulatory framework. This imperative arises from the need to prevent the concentration of privileges in the hands of a single operator, a scenario that can lead to unfair market dominance. Unchecked dominance can stifle innovation and impede the emergence of new entrants into the market. To foster a more equitable environment, it is essential to establish a level playing field where both newcomers and established industry players can compete on equal terms. This approach not only stimulates innovation but also fosters a more competitive marketplace, ultimately benefiting consumers by offering a wider array of services and enhancing the overall health of the industry.

In contrast to passenger transport, the logistics industry is marked by its diverse landscape, encompassing a broad spectrum of participants. As mentioned, this diversity ranges from local start-ups, known for their agility and innovation, to well-established global industry leaders with extensive resources and reach. The coexistence of these various players creates a dynamic and competitive environment where cooperation between competitors is often a rarity. Competition in the logistics sector is characterized by its intensity, and companies vigorously vie for market share and dominance.

Proper regulation plays a pivotal role in sustaining this environment, ensuring that no single operator gains an unfair advantage over others. This is vital to maintain a fair and competitive marketplace that benefits both industry players and consumers. Striking a balance between regulating to avoid the concentration of privileges and fostering is a delicate but crucial challenge. Regulations should be carefully crafted to prevent anti-competitive practices without stifling the ability of companies to innovate and compete effectively.

Companies operating in the logistics sector are increasingly inclined to explore innovative solutions with public support, such as collaborative research projects. However, they often approach these collaborations with caution, striving to preserve their unique corporate identity. Striking the right balance between regulation, competition, and cooperation is essential for the sustainable growth and development of the logistics industry. Effective regulation should provide the necessary guidelines to ensure that businesses can thrive while safeguarding the principles of fair competition, innovation, and corporate identity.

3.6 Learning Processes: Trial-First Approach

EU projects, such as ULaADS, play a pivotal role in empowering cities to develop and optimize their logistics solutions through a hands-on, ground-level approach. This forward-thinking strategy grants districts, cities, and regions the opportunity to implement innovative logistics concepts and witness their practical impact before tailoring specific policies to their local circumstances.

This approach encourages cities to adopt a "trial-first" philosophy, embarking on a journey of experimentation with cutting-edge logistics solutions. This approach is rooted in practicality, enabling municipalities to gain real-world insights into the effectiveness of different logistics models. By engaging in these trials, cities can uncover valuable data regarding the viability, challenges, and

potential benefits of these solutions. It's an invaluable platform for learning through experience, honing logistical strategies that align with the specific characteristics of each city. This approach allows for a deep understanding of what works and what doesn't, all within the context of a particular urban landscape.

Furthermore, this trial-first methodology directly informs the development of SULPs. These plans are not theoretical constructs but are instead grounded in the lessons collected during trials and experiments. By taking this adaptive approach, cities ensure that their logistics policies are finely tuned to the distinct needs and dynamics of their urban environments. This refinement process is essential in fostering innovation and sustainability while enhancing the overall quality of life for residents and businesses. It ensures that policies are not one-size-fits-all but are tailored to the specific challenges and opportunities presented by each city.

This way, a dynamic and responsive framework that encourages cities to explore, experiment, and refine logistics solutions, ensuring they are well-matched to the evolving and unique requirements of urban landscapes. This approach not only fosters innovation but also paves the way for a more sustainable, efficient, and liveable urban future.

Acronyms

Acronym	Meaning
AI	Artificial Intelligence
AV	Autonomous Vehicles
D	Deliverable
EC	European Commission
GA	Grant Agreement
ICT	Information and Communication Technology
LF	Load Factor
LSP	Logistics Service Provider
O	Objective
ODD	On-demand Delivery
P	Product
PPP	Public Private Partnership
PM	Person Month
SUMP	Sustainable Urban Mobility Plan
SULP	Sustainable Urban Logistics Plan
T	Task
UC	Use Case
UCC	Urban Consolidation centre
UFT	Urban Freight Transport
ULaDS	Urban Logistics as an on-Demand Service
WBS	Work Breakdown Structure
WP	Work Package
VUR	Vehicle Utilisation Rate
ZEV	Zero Emission Vehicle

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