

D2.5.6 Curb management to differentiate road usage and optimise use of space



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1. The GRETA project

GRETA project aims to decarbonise the last mile delivery in Functional Urban Areas (FUAs) in Central Europe (CE) and create liveable and accessible cities for all by 2030. The project seeks to implement joint sustainable solutions in CE FUAs using zero-emission vehicles and cargo bikes and reorganise urban spaces with curb management. The pilot actions in the cities of Maribor, Reggio Emilia, Verona, Poznan, and Budapest (with Berlin FUA as an observer) have the potential to quickly deploy as pop-up measures in combination with existing measures. GRETA provides capacity-building activities, strategies, action plans, and tools for public authorities, enterprises, and relevant organisations to ensure financial, environmental, and social sustainability beyond the project's lifetime.

Last-mile delivery generates negative impacts, including emissions, noise, and congestion. Due to the COVID-19 crisis, global parcel distribution volume nearly doubled, further increasing inefficiencies in the peripheral areas. GRETA's FUAs recognise the problems that generate pollution, nuisance, noise, congestion and have jointly recognised three main problems: the lack of use of green zero-emission last-mile vehicles, conflicts between freight and public vehicles, and the lack of knowledge and strategies for a flexible and shared use of the curb and public space. Despite having SUMP/SULPs, FUAs struggle to activate fitting measures while keeping their centres attractive and alive for residents and tourists.

GRETA addresses the common challenges of all CE FUAs by creating the conditions to promote ZE logistics using micro-hubs, cargo bikes, light e-vehicles, and curb management strategies. Additionally, the project also focuses on paving the way to innovative concepts such as regional collaborative logistics, physical internet, and freight curb management. GRETA facilitates the dialogue towards the acceptance of a business and governance as a service model, where cities must equip themselves with a network of innovative services to guarantee seamless experiences for their users and a mobility plan considering different functions and priorities of the services.

GRETA's objective is to support the urban mobility transition in CE FUAs by jointly developing solutions and strategies with a huge potential for decarbonisation of the last mile in line with the EU Green Deal and the Urban Mobility Package, abating congestion, pollution, and nuisance. The project's success relies on capitalising on previous experiences, exploiting synergies with ongoing initiatives, testing innovative pilots, improving competences and knowledge among PPs and stakeholders.



2. Executive summary

This deliverable presents the results of the Budapest pilot action implemented within the GRETA project, focusing on curbside management as a key tool to differentiate road usage and optimise the use of limited public space.

Budapest faces increasing pressure on curbside space due to growing last-mile delivery demand, high parking needs, and competing uses from pedestrians, cyclists, micromobility and services. The pilot aimed to address these challenges by developing and testing a structured Curbside Management Framework and Function Assessment Methodology, allowing data-driven and stakeholder-informed decisions on curbside allocation. The Curbside Management Framework introduces a complex, multi-phase methodology tailored for three planning contexts: comprehensive, project-based, and temporary interventions. The process starts by defining strategic goals and spatial boundaries based on city-level development plans. It continues with extensive on-site data collection - static (what is there) and dynamic (how it is used) - combined with stakeholder input and local business surveys. The collected data supports the creation of current function maps, demand maps, and problem maps for the area. Based on this, a Future Function Map is developed, providing a strategic spatial arrangement of desired curbside functions aligned with local needs, mobility networks and municipal goals.

Two pilot areas were selected in Budapest: an inner-city area in District VIII and a suburban district centre in District IV. These locations represent different urban contexts and logistics demands. Based on on-site observations, data collection and stakeholder consultations, several curbside functions were introduced or reorganised, including loading areas, short-term parking bays, Kiss & Ride spots, designated waiting areas for food delivery cyclists, organised waste container zones, and pedestrian and cycling areas.

The pilot demonstrated that reallocation of curb space from long-term parking towards multifunctional and time-based uses can significantly improve predictability, efficiency and liveability of streets, while reducing conflicts between freight, passenger traffic and public space users. By developing and validating the Curbside Management Framework and Function Assessment Methodology, BKK created a unified planning tool that links strategic mobility and logistics objectives with street-level implementation. The pilot demonstrated that effective curbside management can simultaneously reduce emissions, improve operational efficiency and enhance the quality and predictability of public spaces, while stakeholder engagement and inter-institutional cooperation proved essential for successful implementation.

The validated methodology is modular and scalable, enabling application beyond the pilot areas and informing major urban transformation projects such as the Nagykörút (Grand Boulevard) renewal. The pilot approach can be replicated in other areas of Budapest to support a more coherent and well-functioning curbside system. Overall, the Budapest experience confirms that pilot-based experimentation, supported by robust methodologies and governance, can deliver lasting impact and provides a transferable model for other Functional Urban Areas seeking sustainable, climate-resilient urban logistics solutions.



3. Solution

3.1. General information

Budapest, with a population of around 1.7 million inhabitants, faces growing challenges related to the use and allocation of public space, particularly in the densely populated inner city. Increasing traffic volumes, high demand for parking and loading areas, and the rapid growth of last-mile deliveries often lead to congestion and inefficient use of curbside space across the Functional Urban Area (FUA). Irregular parking, competing uses of the curb, and limited space for logistics operations further exacerbate these challenges, affecting both mobility efficiency and the quality of the public realm.

To address these issues, the GRETA project pilot activities in Budapest focused on testing curbside management solutions in two different urban contexts: an inner-city area in District 8 and a suburban district centre in District 4. The inner-city pilot area is characterised by a dense mix of functions including retail, restaurants, offices and residential buildings, with regulated access for freight vehicles over 7.5 tonnes. The suburban pilot area also hosts mixed functions such as local markets, shops, restaurants and residential uses, with access restrictions for freight vehicles over 12 tonnes. These two areas provided contrasting urban environments for testing and assessing curbside management approaches.

The pilot activities build on the strategic objectives of the Budapest Mobility Plan 2030 (Sustainable Urban Mobility Plan - SUMP), which emphasises the importance of sustainable freight transport and efficient urban logistics. In this context, improving the management of public space - particularly along the curbside - plays a key role in enabling more sustainable mobility solutions and better balancing the needs of different road users. Through the pilot interventions, BKK aimed to better understand local user needs, collect data on current curbside usage, and test different management approaches in real-life conditions. The experience gained contributes to the development of integrated public space management practices and supports the city's broader efforts to promote sustainable urban mobility and logistics.

3.2. Strategy description

The overall objective of the pilot actions is to create green and liveable public spaces in Budapest, have a deep understanding of curbside functions and their effects on city-logistics and to understand curbside management methods considering upscale ability.

BKK developed a curbside management framework, containing curbside function assessment methodology, real-life testing and application of curbside assessment for the pilot area and main inner-city ring road/boulevard in Budapest.

BKK prepared and operated curbside demo sites and activities based on the curb management framework and function assessment methodology, with the involvement of all stakeholders with focus on city logistics. BKK explored and contacted all the possible stakeholders to be involved in the pilot action, assess the base situation of curbside management in Budapest, to develop curb management framework for Budapest in cooperation of the stakeholders (especially the Municipality of Budapest, the public road operator, districts, shared mobility operators).

3.3. Governance model

During the piloting activities BKK tested a practical governance model for curbside management. BKK acted as the coordinating body, working closely with district municipalities, public space managers and local stakeholders. Decision-making followed a structured process combining data analysis, site assessments and stakeholder consultations. This ensured that curbside functions were prioritised based on local mobility



needs, safety considerations, logistics demand and public space quality objectives. The governance model proved effective in balancing competing uses of the curb and enabled coordinated implementation across institutional responsibilities.

The experience confirmed the importance of clear institutional roles and regular coordination between city-level mobility planning and district-level public space management. The governance approach developed in the pilot provides a replicable structure for integrating curbside management into routine planning and implementation processes in Budapest.

The governance model operates within a multi-level policy and regulatory framework. At the local level, district municipalities own and regulate public space and therefore play a key role in approving and implementing street space interventions. The pilot is aligned with several strategic planning frameworks guiding sustainable mobility and urban development in Budapest, including the Sustainable Urban Mobility Plan (SUMP), the forthcoming Sustainable Energy and Climate Action Plan (SECAP), and city design frameworks such as the Healthy Streets Approach. At regional and national level, the Integrated Urban Development Strategy and national transport infrastructure strategies provide broader development objectives, while EU policies - including the Transport White Paper and the Climate Neutral Cities Mission - frame the long-term transition towards low-carbon, safe and people-centred urban mobility.

3.4. Digital and physical infrastructure

The curbside function assessment methodology was being tested through two pilot locations in Budapest (IV. district and VIII. district) during autumn and winter of 2025, where various curbside functions were introduced and monitored. The implementation plans were prepared by Budapest Közút Zrt, the city's public road operator. These plans were based on discussions with the affected districts, combined with initial data collection and needs assessment, leading to the elaboration of the Future Function Map. This process ensured that both local priorities and citywide goals were reflected in the design.

At the pilot sites dedicated curbside functions were introduced, including reorganization and reallocation of curbside functions in the pilot area (developing multifunctional public space, changing function and purpose within a day), providing proper and enough space for all the necessary functions based on the assessment methodology, curbside management framework and preliminary data collection.

4. Impact

4.1. Environmental, economical and social impact assessment of the solution

The outcomes of the Budapest curbside management pilot align with the objectives defined, confirming the relevance and effectiveness of the implemented measures.

- Efficient use of limited public space and improving liveability and greening of public spaces: By reallocating curb space away from long-term parking towards multifunctional uses, pedestrian areas and organised service zones, the pilot contributed to a more liveable, predictable and human-scaled street environment.
- Resolving opposing stakeholder interests: The methodology's strong emphasis on stakeholder involvement, local business surveys and on-site observation proved effective in identifying conflicts early and developing balanced solutions that reflect multiple user needs.
- Data collection for curbside management and SULP development: The pilot generated high-quality static and dynamic data on curbside usage, logistics demand and behavioural patterns, directly



supporting both the refinement of the curbside management framework and the preparation of Budapest's Sustainable Urban Logistics Plan.

- Creation of an upscalable and unified planning tool: The validation of the Function Assessment Methodology in real-world conditions confirmed its applicability beyond the pilot sites, fulfilling the objective of creating an upscalable tool for citywide and corridor-level planning, including major projects such as the Nagykörút renewal.

5. Lessons learnt

- Curbside management topic is unique and neglected in European cities based on benchmarks, yet very important for achieving organized and liveable public space
- Stakeholder engagement can be fostered with clear communication putting emphasis on the stakeholder's gains and interests and letting long enough time for involvement, processing and responses
- A Curbside Management Framework should be formally integrated into the planning processes and require its application in relevant public space and street renewal projects, particularly where freight and service activities are significant.
- Link curbside planning to Sulp implementation: The methodology should be used as an operational tool within the forthcoming Sustainable Urban Logistics Plan, ensuring that strategic logistics objectives are reflected in concrete street-level interventions.
- Cross-institutional cooperation should be strengthened: Maintain and formalise cooperation between BKK, the Municipality, district governments and Budapest Közút Zrt. to ensure coherent decision-making and efficient implementation.
- Transferability and knowledge sharing to be supported more: Document lessons learned and share the Budapest methodology with other districts and Central European cities, contributing to broader uptake of sustainable curbside and urban logistics solutions.

6. Transnational Cooperation

6.1. Scaling-up

Scaling up the pilot does not only mean replicating the specific interventions implemented in the test areas. The main objective is to embed a **systematic curbside management approach** in urban mobility and public space planning in Budapest. The pilot demonstrated that curbside space should be managed as a strategic urban resource where different uses (such as freight loading, passenger access, micromobility, public transport support functions and public realm uses) need to be actively prioritised and balanced.

A key lesson concerns the **criteria used to prioritise and differentiate road users**. During the pilot, curbside allocation decisions were based on a multi-criteria framework combining street hierarchy and typology, urban context, logistics demand, policy objectives (sustainability, modal shift, liveability) and operational necessity (e.g. freight loading, waste collection or short-term access). This approach allows cities to move from demand-driven parking management towards **policy-oriented space allocation**. Scaling up therefore focuses on extending the **planning methodology and governance model** developed during the pilot. This includes the use of structured assessment procedures, mapping of existing and future curbside functions, and evidence-based decision-making supported by data collection on curbside use.

The pilot also confirmed the importance of **data-driven monitoring**. Combining field observations, user behaviour analysis and stakeholder feedback made it possible to evaluate the performance of curbside functions and adjust regulations when necessary. Establishing a consistent monitoring framework will therefore be essential when extending the approach to additional streets and districts. Another important



lesson concerns **stakeholder engagement**. Curbside reallocation often affects several user groups with competing needs. Early involvement of district municipalities, local businesses, logistics operators and residents proved important for identifying local constraints and increasing acceptance of the measures. While the design of individual interventions depends on local spatial conditions, the methodology developed during the pilot can be applied to other street renewal and public space projects in Budapest. The approach is already being used in ongoing planning processes, including the preparation of the Grand Boulevard (Nagykörút) renewal programme, and will support the wider integration of curbside management into urban mobility planning.

Table 1 Scaling up – plans and recommendations

Plans for scaling up the solution in the pilot area.	<p>After a careful monitoring process, the idea is to implement the similar curbside management actions in other areas of Budapest. In the long-term period, the aim is to create a well-organized, liveable streets all over the city.</p> <p>Supporting the renewal of the Grand Boulevard (Function assessment and survey for shops): The pilots are more than temporary measures; they represent a testing ground for scalable solutions. By validating the Curbside Management Framework and methodology in real-world conditions, Budapest aims to create a curbside system that can be flexibly adapted to different urban contexts. Beyond the pilot interventions, the methodology is also providing input to the upcoming Grand Boulevard (Nagykörút) renewal project, one of the city's most complex public space transformations. Integrating logistics-friendly curbside design into this renewal is a priority, ensuring that freight and passenger needs can coexist within a multifunctional, climate-adaptive, and people-friendly street environment.</p>
Suitability for scaling-up	<p>The pilot can be implemented in other areas of Budapest to contribute to well-functioning, organized curbside alignment. The curbside actions realized in the frame of GRETA project, can be expanded or enhanced in order to increase the area (involve more districts), involve more shops reaching out to longer curbside sections.</p>
Identified risks for scaling up and solutions to overcome them (risk mitigation).	<p>Upscaling may bring operational difficulties to the road operator, as larger areas need more effort and manpower to maintain.</p> <ul style="list-style-type: none">• One of the main challenges in scaling-up the curbside management pilot (and assessment methodology) is adapting it to the specific and various infrastructure of the different parts of cities.• Ensuring compatibility with existing planning guides, standards and suggestions.• Stakeholder engagement and collaboration with local authorities• Flexibility and adaptability of the solution to accommodate various logistics requirements.



6.2. Transfer

By validating the Curbside Management Framework and methodology in real-world conditions, Budapest aims to create a curbside system that can be flexibly adapted to different urban contexts. Beyond the pilot interventions, the methodology is also providing input to the upcoming Grand Boulevard (Nagykörút) renewal project, one of the city’s most complex public space transformations. Integrating logistics-friendly curbside design into this renewal is a priority, ensuring that freight and passenger needs can coexist within a multifunctional, climate-adaptive, and people-friendly street environment.

The Budapest pilot demonstrates that curbside management strategies can be transferred to other urban areas when the **planning methodology is distinguished from context-specific design solutions**. While the detailed configuration of curbside spaces depends on local conditions, the strategic approach and decision-making framework are broadly applicable. Several elements of the pilot are context-specific, including local traffic patterns, existing parking regulation systems, institutional responsibilities, and the physical characteristics of street cross-sections. These factors influence the exact design and scale of curbside interventions and therefore need to be adapted in each city. At the same time, the pilot identified a number of **transferable components** that can support curbside management strategies in other Functional Urban Areas. These include the use of a structured multi-phase planning process, systematic data collection on curbside use, the mapping of current and future curbside functions, and the evaluation of existing uses to identify well-functioning, missing or conflicting functions. Another transferable element is the **typology-based differentiation of road usage**. Allocating curbside functions according to the role of the street within the urban mobility network helps balance the needs of freight transport, passenger mobility, micromobility and public space functions. This approach supports more transparent and policy-aligned allocation of limited street space.

The pilot also showed the importance of combining **regulatory instruments and spatial planning tools**. Measures such as time-based space-usage rules, reallocation of parking spaces and the designation of loading zones can be effective when supported by clear governance arrangements and coordination between mobility planners, road operators and local authorities. Transfer requires strengthening **data-based monitoring and evaluation**. Cities applying similar approaches should combine baseline assessments, stakeholder consultations and post-implementation monitoring in order to assess impacts and adjust curbside regulations when needed. By separating context-dependent design elements from transferable planning principles, the Budapest pilot provides a **replicable framework for cities seeking to optimise public space allocation and better manage competing curbside demands**, particularly in the context of growing urban logistics activity and the transition towards more sustainable mobility systems.

Table 2 What to expect - problems and solutions

Problems and solutions	
Problems faced	<p>One of the main issues is the adaptation of curbside management actions to the diverse urban and infrastructural conditions of different parts of Budapest. Street cross-sections, parking arrangements, traffic volumes and utility layouts vary significantly across districts, making uniform application of solutions challenging.</p> <p>Another challenge related to operational and maintenance capacity. Scaling up curbside management measures to larger areas increases the workload of the road operator, as more resources and manpower are required for maintenance, monitoring and enforcement of curbside functions.</p> <p>Stakeholder alignment proved to be complex, as different user groups (residents, shop owners, logistics operators, delivery services and local authorities) often have competing expectations regarding curbside use, especially in dense inner-city environments.</p>



<p>Corrective actions taken</p>	<p>To address these challenges, BKK applies a flexible and modular approach to the Curbside Management Framework, allowing interventions to be adapted to local street conditions rather than applying standardised layouts. This ensures that solutions remain context-sensitive while still following a unified methodology.</p> <p>Close cooperation is established with the public road operator to integrate operational and maintenance considerations into the design and implementation phases.</p> <p>Stakeholder engagement is strengthened through targeted consultations with local businesses, residents and logistics operators, as well as on-site feedback collection during the pilot operation phase, enabling fine-tuning of curbside functions based on actual user behaviour.</p>
<p>What to watch out for</p>	<p>Based on the pilot experience, the following aspects should be considered when implementing and scaling up curbside management solutions:</p> <ul style="list-style-type: none">• Context-specific application: the methodology should always be adapted to local infrastructural, functional and traffic conditions,• Operational capacity and resources: scaling up requires adequate staffing and maintenance capacity on the side of the road operator,• Alignment with existing planning and regulatory frameworks: early coordination with relevant guidelines and authorities is essential,• Continuous stakeholder engagement: ongoing dialogue with residents, businesses, logistics operators and local authorities is crucial to ensure acceptance and effective operation,• Flexibility and adaptability: curbside solutions must be able to accommodate different logistics needs, time-based demands and future mobility trends. <p>During the pilot operation the Municipalities or BKK did not receive any complaints from citizens, operators or road users, signs are understandable. Food delivery companies suggest using the designated areas for delivery colleagues in internal communication and onboarding education. When scaling up, user feedback has to be collected more widespread as on a larger scale it is more difficult to reach all users in advance to prepare for a change.</p>

7. Conclusions

Through the GRETA project, Budapest has moved beyond isolated experiments and laid the foundations for a systematic, data-driven approach to curbside management that directly supports decarbonisation, liveability and efficient last-mile logistics.

The curbside management pilot confirmed that the curb is a critical and limited urban resource, where competing demands from freight, micromobility, public transport, private vehicles and public life must be actively managed rather than passively regulated. By developing and validating the Curbside Management Framework and Function Assessment Methodology, BKK created a unified planning guide that bridges the gap between strategic policy objectives and street-level implementation. This represents a significant step forward in aligning Sustainable Urban Mobility Planning with day-to-day public space operations.



The pilot actions showed that effective curbside management can contribute simultaneously to multiple policy goals: reducing emissions from last-mile delivery, improving traffic efficiency, increasing the quality and predictability of public spaces, and supporting emerging logistics and mobility services. The Budapest pilot also demonstrated the importance of stakeholder involvement and inter-institutional cooperation, proving that conflicts around curbside use can be addressed through transparent, evidence-based planning processes.

By developing and validating the Curbside Management Framework and Function Assessment Methodology, BKK created a unified planning tool that links strategic mobility and logistics objectives with street-level implementation. The pilot demonstrated that effective curbside management can simultaneously reduce emissions, improve operational efficiency and enhance the quality and predictability of public spaces, while stakeholder engagement and inter-institutional cooperation proved essential for successful implementation.

The validated methodology is modular and scalable, enabling application beyond the pilot areas and informing major urban transformation projects such as the Nagykörút (Grand Boulevard) renewal. Overall, the Budapest experience confirms that pilot-based experimentation, supported by robust methodologies and governance, can deliver lasting impact and provides a transferable model for other Functional Urban Areas seeking sustainable, climate-resilient urban logistics solutions.

As lessons learned BKK concluded that effective curbside management in Budapest requires clear, benefit-oriented stakeholder communication with sufficient time for engagement, the formal integration of a Curbside Management Framework into planning and street renewal processes, and its use as an operational tool within the Sustainable Urban Logistics Plan. Stronger, institutionalized cooperation between city and district actors is essential for coherent implementation, while systematic documentation and knowledge sharing can support transferability to other districts and Central European cities.

The pilot approach can be replicated in other areas of Budapest to support a more coherent and well-functioning curbside system. The curbside measures implemented within the GRETA project can be extended or further developed to cover larger areas, involve additional districts and businesses, and apply the methodology along longer curbside sections.

While the pilot focused on specific curbside interventions within a defined urban area, its primary added value lies in the strategic and methodological insights gained regarding differentiated road usage and the optimisation of public space allocation. The experience demonstrates that curb management can function as a structured governance instrument to balance competing mobility, logistics and public space demands in a transparent and policy-driven manner.

A key lesson concerns the criteria applied to prioritise and differentiate road users. Allocation decisions were based on a multi-criteria framework combining street hierarchy and typology, urban context and built environment characteristics, strategic policy objectives (sustainability, liveability, modal shift), functional necessity (freight loading, waste management, public transport operations), spatial efficiency (turnover, time-based use), and user vulnerability (pedestrians, cyclists and micromobility users). This ensured that curbside differentiation aligned with long-term mobility and urban development goals rather than short-term parking pressures.

The pilot clearly distinguished between context-specific and transferable elements. Context-specific components include local traffic volumes and modal split, legal and institutional competences of district authorities, street cross-sections, built environment density and spatial constraints. These factors determine the precise scale and configuration of interventions and require adaptation in each urban setting.

Transferable components include the structured multi-phase methodology, the street typology-based prioritisation logic, the functional classification system (well-functioning, poorly functioning, missing, undesirable), the Future Function mapping approach, and the evaluation framework combining operational, environmental and social indicators. Together, these elements form a modular curb management toolkit



that can be replicated in other Functional Urban Areas seeking to systematically differentiate road usage and optimise public space allocation in an evidence-based manner.

In conclusion, the GRETA project experiences in Budapest confirm that well-designed pilot actions, supported by robust methodologies and strong governance, can catalyse lasting change. The Budapest approach offers a transferable model for other cities seeking to reconcile logistics needs with liveable, climate-resilient urban environments and provides a solid foundation for scaling up sustainable urban freight solutions across the Functional Urban Area.

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