Data-driven and Dynamic Space and Assets for Physical Internet-led Urban Logistics and Planning

D7.3 Replication Booklet on Implementation Cases

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Abstract

Deliverable 7.3 ("Replication Booklet on Implementation Cases") serves as a practical guide for replicating innovative urban freight and logistics solutions developed across DISCO Starring and Twinning Living Labs. The document's primary objective is to facilitate knowledge transfer and assist Follower Sites, specifically Aarhus, North Hesse, Piacenza, and Prague 6, in addressing last-mile logistics challenges such as curbside congestion, inefficient parcel delivery, and space competition.

To achieve this, this deliverable provides tailored implementation roadmaps, evaluating site-specific urban freight contexts, local constraints, and policy goals. It outlines actionable strategies to deploy DISCO-X solutions, including smart curb management, dynamic parcel lockers, and off-street asset optimisation. Ultimately, the document aims to support local authorities and logistics stakeholders in transitioning from static space planning to dynamic, data-driven urban logistics systems, fostering sustainable, scalable, and zero-emission urban distribution across European cities.

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Summary sheet

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List of acronyms

APU	Area Pedonale Urbana / Urban Pedestrian Area(s) (Piacenza, Italy)
CEP	Courier, Express and Parcel (delivery operators/segment)
EU	European Union
KPI	Key Performance Indicator
LEZ	Low Emission Zone
LL	Living Lab
MaaS	Mobility-as-a-Service
PID	Pražská Integrovaná Doprava – Prague Integrated Transport (network)
PIN	Personal Identification Number (used to unlock Dynamic Locker units)
PUG	Piano Urbanistico Generale – General Urban Plan (Piacenza, Italy)
PUMS	Piano Urbano della Mobilità Sostenibile – Sustainable Urban Mobility Plan (Italy)
SULP	Sustainable Urban Logistics Plans
SUMP	Sustainable Urban Mobility Plan
SmaLa	Smarte Liefer- und Ladezonen (“Smart Delivery and Loading Zones”), German Federal Ministry of Transport programme cited as a cost benchmark for North Hesse/Kassel
SWOT	Strenghts, Weakenesses, Opportunities, Threats
VEP	Verkehrsentwicklungsplan – Transport Development Plan (City of Kassel, e.g. “VEP Kassel 2030”)
VMS	Variable Message Sign(s)
WP	Work Package
ZTL	Zona a Traffico Limitato – Limited Traffic Zone (Italy)

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1. Introduction

The rapid growth of e-commerce and urban freight transport presents significant challenges for European cities striving to meet decarbonization targets, optimize street space, and improve quality of life. Within the DISCO project framework, capacity building and knowledge exchange serve as essential drivers for transitioning toward data-driven, sustainable, and efficient urban logistics ecosystems. Rather than forcing municipalities to design solutions from scratch, the project leverages proven physical and digital logistics innovations—such as smart curbside management, micro-consolidation hubs, and federated data-sharing platforms—to fast-track sustainable urban transport planning across diverse territories.

A central element of this strategy is the structured collaboration between mature Living Labs (Starring and Twinning) and designated Follower sites, including Aarhus, Piacenza, Prague, and North Hesse. By systematically engaging these Follower Sites through interactive webinars and regular online coordination sessions, the project establishes a continuous peer-learning mechanism. This collaborative model allows early-adopter regions to evaluate the technological readiness, operational feasibility, and local adaptability of innovative logistics tools against their unique spatial, economic, and regulatory environments.

Ultimately, evaluating transferability ensures that innovative logistics models do not remain isolated pilot achievements, but instead become scalable strategies applicable across varied European contexts. By assessing local readiness and identifying city-specific barriers, Follower sites are empowered to translate shared insights into concrete, tailored implementation roadmaps. This replication booklet synthesizes the key findings, feasibility assessments, and operational frameworks developed throughout this exchange, offering a comprehensive reference to guide Aarhus, Piacenza, Prague, North Hesse, and other European municipalities in successfully adopting next-generation urban logistics solutions.

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2. Executive summary

This deliverable (D7.3 – "Replication Booklet on Implementation Cases") is the main output of Task 7.2, through which POLIS worked with four DISCO Follower Sites – Aarhus (Denmark), North Hesse/Kassel (Germany), Piacenza (Italy) and Prague 6 (Czechia) – to assess how the DISCO-X innovations tested in the project's Starring and Twinning Living Labs could be transferred to new urban contexts.

Between October 2025 and April 2026, a dedicated webinar series, monthly coordination meetings and one site visit to Padua gave the Follower Sites direct exposure to DISCOCURB, DISCOLLECTION, DISCOPROXY and DISCOESTATE and to the cities that piloted them, including Copenhagen, Helsinki, Padua, Barcelona, Valencia, Thessaloniki, Zaragoza and Ghent. Each Follower Site then turned this exchange into a standalone feasibility study, following a common structure, assessing its own urban freight challenges, and setting out a phased pathway towards a first pilot.

Although the four sites differ markedly in size, institutional set-up and planning maturity, they converge on a single starting point: curb space is scarce, contested and poorly documented in all four cities, and DISCOCURB – data-driven, dynamic curbside management – is judged the most transferable, lowest-risk solution to address it, whether adopted on its own or paired with a complementary DISCO-X innovation. The four feasibility studies are summarised below.

Aarhus faces freight congestion, limited loading space, and rising e-commerce demand while lacking real-time data on loading bay usage. The city selected DISCOCURB to establish an evidence base for its upcoming Sustainable Urban Logistics Plan, using sensor and connected truck data to optimize curbside space and transition toward a bookable loading zone system. Aarhus plans to engage local operators and establish baseline usage data, move into deploying sensor-based occupancy monitoring, and eventually integrate these findings into its logistics plan to explore bookable bays and Zero Emission Zones.

North Hesse / Kassel struggle with severe parking pressure, space competition, misuse of designated loading zones, and delivery vehicles double-parking or blocking footways. They are adopting DISCOCURB alongside DISCOBAY, with DISCOPROXY and DISCOESTATE planned as future steps. Their goal is to obtain a baseline of loading area occupancy and misuse while screening existing parking facilities for off-street logistics assets before making major infrastructure investments. Starting with municipal alignment and a digital inventory of loading areas, they plan to conduct market dialogues with operators, pilot a few monitored or bookable loading zones, and evaluate user acceptance and enforcement before scaling up.

Piacenza deals with a historic medieval centre characterised by narrow streets, access restrictions, vacant storefronts, and heavy morning delivery traffic that triggers widespread illegal parking. By choosing DISCOCURB, the city aims to shift from static space planning to a dynamic, data-driven curbside system. Piacenza will use sensors, variable-message signs, and real-time dashboards to

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streamline delivery efficiency and curb illegal parking, targeting high-demand zones by analysing pass data and traffic enforcement records to feed live data into its municipal plans.

Prague 6 suffers from uncoordinated parcel locker proliferation on private land, double-parking, and a lack of municipal logistics data driven by rapid e-commerce growth. The district is implementing DISCOPROXY and DISCOCURB by replicating the Padua Living Lab model, using dynamic parcel lockers mounted on mobile electric platforms along with bookable loading zones. Its roadmap involves securing regulatory approvals with Prague City Hall, collaborating with academic and private partners, and moving into a limited-scale trial testing bookable bays paired with dynamic mobile pods.

Beyond these individual roadmaps, three cross-cutting messages emerge from the four studies, discussed in detail in the Remarks and Conclusions chapters. First, technology alone is not sufficient: the Padua Living Lab shows that even sensors, a booking application and variable-message signs did not eliminate unauthorised occupation of loading zones, so governance, signage and enforcement have to be designed in from the start rather than added afterwards. Second, every site plans to start small – a geographically limited pilot, evaluated before any wider roll-out – rather than importing a full DISCO-X package at once. Third, none of the four sites treats its next step as a stand-alone project: each intends to fold its DISCO findings into an existing or forthcoming strategic planning instrument – a Sustainable Urban Logistics Plan in Aarhus and Piacenza, the Kassel City Logistics Concept in North Hesse, and a City Hall implementation plan in Prague 6 – so that the knowledge generated through DISCO becomes part of each city's durable planning toolkit rather than a one-off pilot outcome.

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3. Methodology and approach

The main objective of Task 7.2 was to drive capacity building and knowledge transfer across four DISCO Follower sites (Aarhus, Piacenza, Prague, North Hesse) by showcasing DISCO X innovations through a dedicated webinar series and regular online coordination meetings. Through these interactive exchanges, Follower sites evaluate the readiness, local feasibility, and transferability of these solutions to address their specific urban logistics challenges. Ultimately, this collaborative process guides Followers in defining tailored implementation plans and consolidating their findings into this final replication booklet.

Task 7.2 run from Month 25 to Month 40 and it has been led by POLIS, drawing upon the active collaboration of key municipal and research participants. To actively drive the adoption, feasibility assessment, and transferability of DISCO results across Follower sites, the project team structured comprehensive peer-to-peer engagement and capacity-building process.

Central to this approach was a dedicated **webinar series** featuring guest speakers and technical leads from across all participating Starring and Twinning Living Labs and one additional external speaker. Throughout these interactive sessions, speakers systematically presented and demonstrated the full suite of **DISCO X innovations**, transferring key lessons learned, technical prerequisites, and operational insights directly to the Followers.

To maintain momentum and ensure seamless execution across all participating partners, regular online coordination and alignment meetings have been established. These recurring sessions provided a collaborative space to:

- **Guide Follower Engagement:** support Follower cities as they mapped out relevant DISCO X innovations against their specific local needs and potential future Sustainable Urban Logistics Plans (SULPs).
- **Monitor Analytical Progress:** oversee the ongoing qualitative evaluations, including SWOT analyses, infrastructure/data requirements, and implementation timelines.
- **Streamline Feedback Loops:** facilitate continuous dialogue between Living Labs solution providers and Follower sites to address implementation barriers and prerequisites.

Ultimately, this ongoing exchange and structured webinar framework provided the foundation for Followers to consolidate their findings into comprehensive feasibility reports. Furthermore, the insights and feedback gathered during these regular touchpoints and webinar discussions have been directly synthesised to inform the **"Replication Booklet on Implementation Cases,"** ensuring that the knowledge generated is effectively packaged for broader transferability and final conference dissemination.

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By leveraging the project's centralized Knowledge Hub as an institutional memory and technical repository, Task 7.2 ensured that solutions developed in primary testing environments have been systematically evaluated, adapted, and potentially prepared for long-term implementation across diverse European urban environments. This process transformed abstract concepts into potentially concrete, localised initiatives, ensuring that the project's outputs generate impact well beyond the initial test sites.

Task 7.2 officially started mid-2025 with a kick-off meeting that took place online on 24 June 2025. Regular catch-up monthly meetings took place between September 2025 and July 2026. The webinar series started in October 2025 and ended in April 2026, as detailed in the table below.

Date	DISCO-X innovation	Speakers
Monday 27 October 2025	DISCOCURB	• Luca Braidotti (Municipality of Padova), Focus on the Padova's Living Lab • Paola Astegiano (FIT), focus on the Copenaghen's and Helsinki's Living Labs • Pietro Peyron (Populus), Focus on additional best practices beyond DISCO
6 November 2025	DISCOLLECTION	• Hugo Martínez Lanza (CARNET-UPC), focus on the Barcelona's Living Lab • Matias Oikari (Forum Virium), focus on the Helsinki's Living Lab
6 February 2026	DISCOESTATE	• Gabriel Ferrús (Fundación Valenciaport), focus on the Valencia's Living Lab • Vasilis Giannoudis (CERTH), focus on the Thessaloniki's Living Lab
17 February 2026	DISCOPROXI	• Domien Stubbe (VIL) and Bart Lannoo (Be-Mobile), focus on the Ghent's Living Lab • Alfonso Molina (CityLogin), focus on the Zaragoza's Living Lab
19 April 2026	DISCO Meta Model Suite	• Vasilios Giannoudis (CERTH)

Table 1: The Webinar Series in detail

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The episode focusing on DISCOBAY did not take place as it was no longer deemed necessary; previous presentations had already sufficiently addressed DISCOBAY related innovations alongside the other collected data.

Organised and chaired by POLIS, each workshop followed a consistent format and ran for 60 to 90 minutes to keep discussions focused yet comprehensive. The sessions began with in-depth presentations from invited speakers, which seamlessly transitioned into an interactive Q&A session with the audience. To encourage collaborative engagement and capture input in real time, a Miro board was used as a shared digital workspace for gathering ideas, sparking discussion, and visually organizing feedback. For anyone unable to attend or looking to review the content, all presented materials, board outputs, and video recordings have been uploaded to the DISCO SharePoint online.

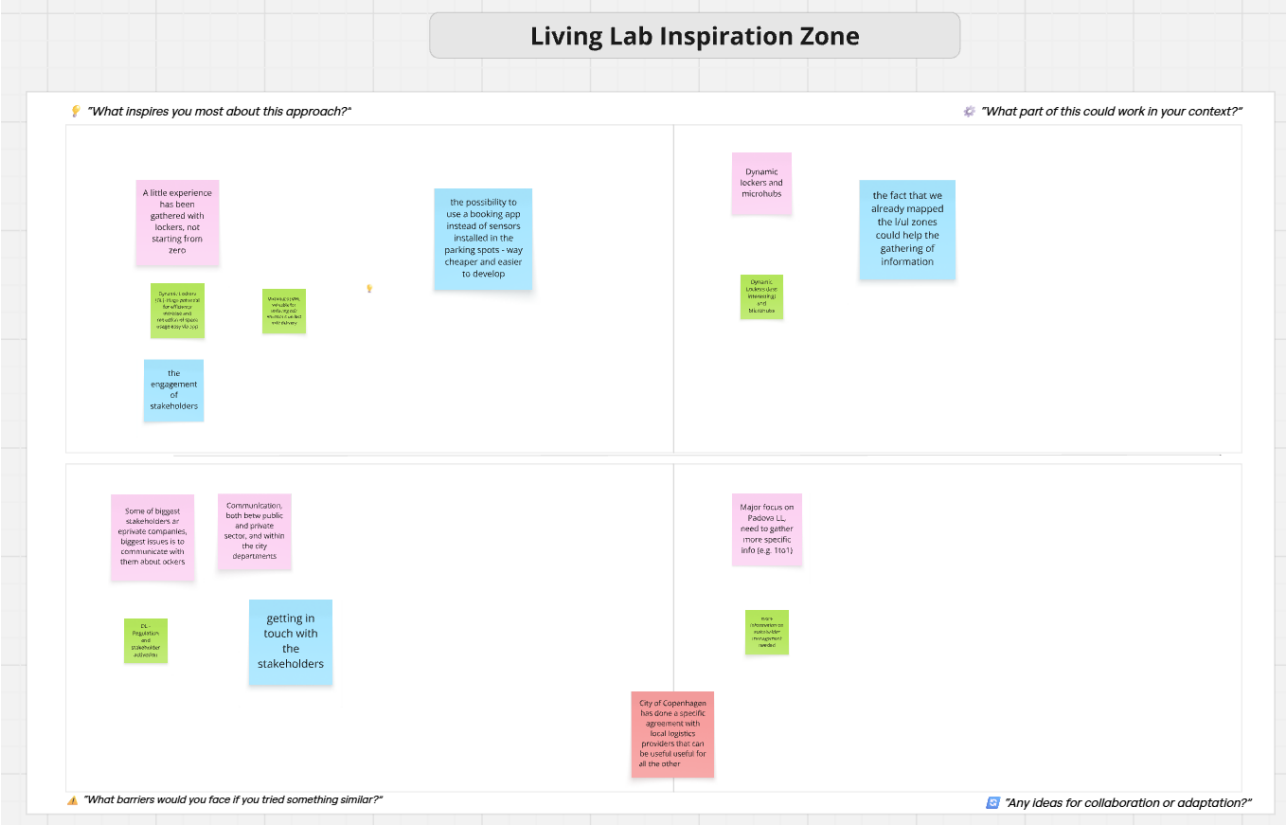


Figure 1: Screenshot of one of the Miro's boards used during the Webinar Series

It is worth adding that the city of Piacenza has organised on its own a visit to Padova in autumn 2025, due to advantage of its location (only a few hours drive) and the possibility to exchange in Italian.

Another site visit was organised by POLIS on 5 May 2026 again in Padova, following the interest from all parties to the solutions tested in the Italian city. Representatives from North Hesse and

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Prague attended on site. The objective was to better understand the policy measures implemented in the city centre and see first-hand the vehicles realized by NEXT. The site visit was kindly hosted by the colleagues from the Municipality of Padova, and with the support from Venice University and NEXT.



Figure 2: The site visit in Padova (Photo: R. Vergnani)



Figure 3: The NEXT vehicle (Photo: R. Vergnani)

The following pages present the feasibility studies developed by each of the four Follower Sites. To ensure consistency and facilitate cross-site analysis, all four studies follow a standardized structure, shared methodology, and common table of contents. Each study explores the local context and assesses the technical and operational viability of replicating the solutions tested in the Starring and Twinning cities. Specifically, each site report includes:

- Background and geographical context
- Overview on current urban freight and logistics challenges
- Links with other projects and initiatives

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- Main learnings from the Webinar Series and the DISCO project
- Rationale of solutions chosen
- SWOT Analysis
- Recommendations and next steps

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4. Focus on the Follower Sites

4.1 Aarhus

4.1.1 Background and geographical context

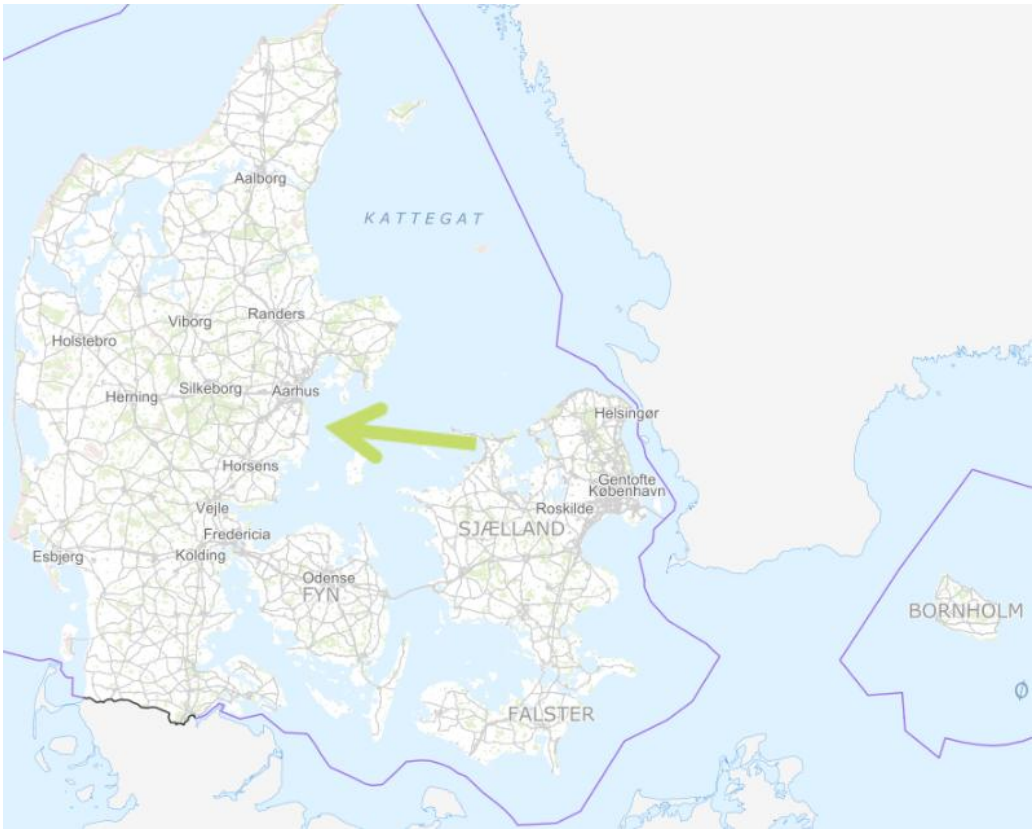


Figure 4: Aarhus geographical location

Aarhus is Denmark's second largest city, with approximately 375,000 inhabitants in the municipality and around 75,000 residents living within the central urban area bounded by the inner ring road. The city serves as a major economic, educational and logistics hub in Denmark and hosts the country's largest container terminal, handling approximately 75% of Denmark's seaborne container freight, equivalent to more than 10 million tonnes of freight annually.

Transport patterns in Aarhus are characterised by a significant share of private car use, although cycling and walking become increasingly dominant closer to the city centre. Freight transport plays

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a significant role in overall mobility patterns. Vans and trucks account for approximately 16% of total vehicle kilometres travelled, reflecting the city's importance as a regional logistics centre.

Aarhus has long pursued policies aimed at balancing accessibility with urban quality. The city centre contains one of Northern Europe's longest pedestrianised shopping districts, established in 1972, and is supported by loading zones, delivery time windows, and a Low Emission Zone (LEZ). The LEZ covers the area within the inner ring road and regulates entry of higher-emission vehicles through automatic number-plate recognition systems.

While Aarhus has historically addressed freight and logistics issues on a case-by-case basis, the municipality approved its Sustainable Urban Mobility Plan (SUMP) in 2025 and is now preparing a Sustainable Urban Logistics Plan (SULP). The SULP will establish a strategic framework for sustainable urban freight and logistics policies in the coming years. The SULP process represents an important shift from reactive freight management towards a long-term strategic approach that integrates logistics into wider mobility, climate and urban development policies.

4.1.2 Overview of current urban freight and logistics challenges

The municipality joined DISCO because of growing challenges related to urban freight distribution, congestion, sustainability objectives and increasing demand for efficient last-mile logistics. Population growth and expanding economic activity continue to increase pressure on street capacity, loading infrastructure and urban public space.

Several freight-related challenges have been identified:

- Growing freight demand linked to increasing e-commerce activity.
- Congestion caused by vans and delivery vehicles especially in city centre.
- Limited space for loading and unloading operations in city centre.
- Need to reduce greenhouse gas emissions from freight transport.
- Challenges in balancing commercial logistics needs with pedestrian-friendly urban environments.
- Limited data regarding the actual use of loading zones and freight infrastructure.

Aarhus already applies several regulatory measures, including:

Low Emission Zone

Since 2010 there has been established a Low Emission Zone (LEZ) in Aarhus within the inner ring road. The LEZ restricts the types of vehicles allowed to enter the inner city. First it was only trucks and busses, but from 2023 also cars are affected. The scope is to make larger and older trucks drive around the city centre and not through it.

For cars and vans the euronorm 5 is the minimum, otherwise a particulate filter is needed. For trucks and busses euronorm 6 is the minimum, otherwise a particulate filter is needed. The zone

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is monitored through ANPR cameras at every access point, and fines are given automatically from a centralised system that has all license plate information. The central system is also used in all other Danish cities that have a LEZ.
Foreign cars and trucks are required to register at the latest on the day they drive in the zone, otherwise they will be fined 1.500kr (200EUR) for cars or 12.500kr (1.667 EUR) for trucks that are not permitted in the zone.
The LEZ imposes regulations on especially older diesel trucks, vans and cars, and aims to limit particle emission through fewer heavy emission vehicles in the city centre.
As seen on the official list of requirements, diesel cars- and vans from before 2011 will have to be registered and either fulfil the euronorm minimum or have a particulate filter installed to be permitted.
For diesel trucks and busses, the cutoff date is before 2015 and euronorm 6, otherwise a particulate filter is needed. Time-restricted freight access in pedestrian streets between 04:00 and 11:00.

Vehicle	Description	Registered for the first time	Euronorm Minimum
	Passenger car	A passenger car is to be registered if it was registered for the first time before January 1st 2011	5
	Minibus weighing under 3,5 tonnes, with over 9 seats (incl. driver)	A minibus is to be registered if it was registered for the first time before January 1st 2011	5
	Van weighing under 3,5 tonnes	A van is to be registered if it was registered for the first time before September 1st 2016	5
	Truck weighing over 3,5 tonnes	A truck is to be registered if it was registered for the first time before January 1st 2015	VI
	Bus weighing over 3,5 tonnes, with over 9 seats (incl. driver)	A bus is to be registered if it was registered for the first time before January 1st 2015	VI

Figure 5: Official list of requirements for diesel vehicles from "Miljoezoner.dk"

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Figure 6:Low Emission Zone in Aarhus city centre within the inner ring road O1

Designated offloading sites

Furthermore, off-loading sites have been established throughout the inner-city centre with designated parking spots for trucks. The designated spots are often multipurpose-use, with off-loading from 04-13 for trucks and then being reserved for taxis or for ordinary parking (payment) for the rest of the day. The off-loading sites are strategically placed in the urban centre in near the pedestrian area.

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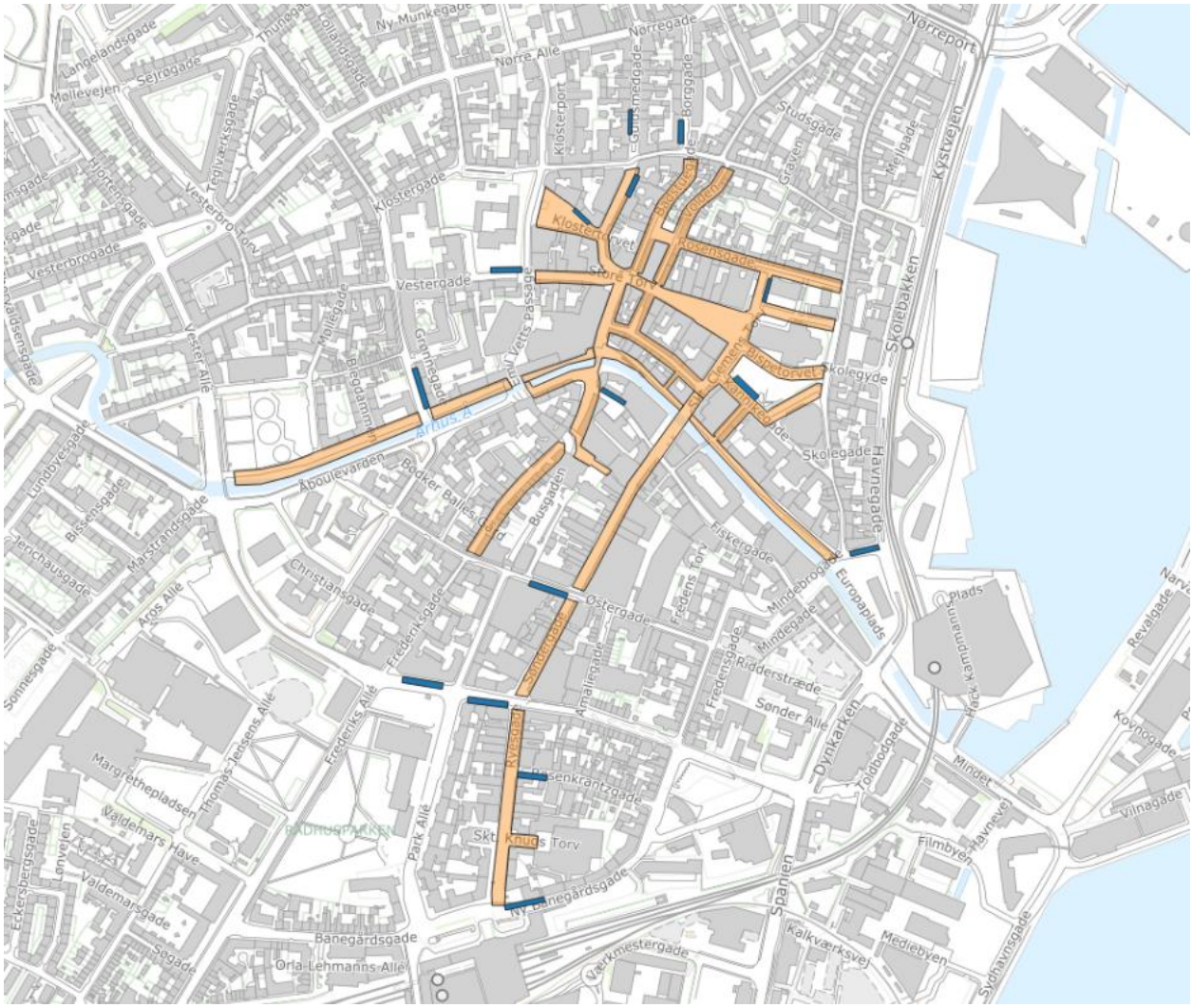


Figure 7: Designated offloading sites (in blue) in connection with the pedestrian streets in Aarhus (yellow)

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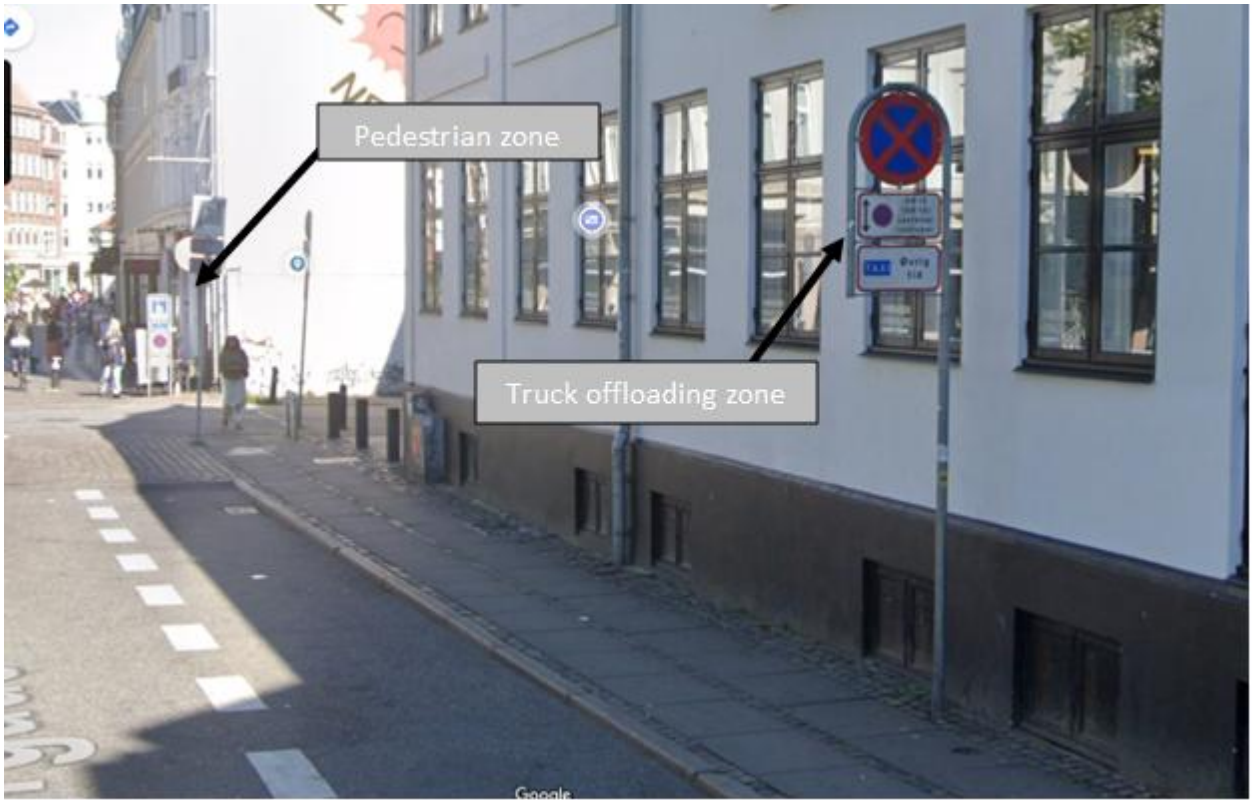


Figure 8:Example of a designate offloading site for trucks in proximity to the pedestrian area in Aarhus

Weight limitations

In the pedestrian area a weight limitation is being enforced. Trucks/vans over 7,5 Tonnes are not permitted to park or stop outside truck offloading zones (if zero emission 9 tonnes). That means that if you operate a truck in the pedestrian area, you should comply with both the timespan restrictions with deliveries from 04-11 and the weight limitations, meaning that you can only park on truck offloading sites.

Pedestrian zone

In city centre a pedestrian area is defined, where time limits for freight drop off is established from 04-11. The pedestrian zone has been established since 1972 and is where the highest valued commercial locations are placed. The zone/streets offer a safe and undisturbed shopping experience for the consumer, with shops ranging from shopping centres to local specialised vendors. In reality imposing car restrictions on a city centre comes with a set of impacts for the commercial industry. First of all, the shop owners need to get used to their costumers not being able to park right outside their shop. Secondly deliveries and freight in general becomes more troublesome because of the various physical and regulatory restrictions. Although pedestrianisation initially faced strong backlash from local shop owners and residents, it ultimately proved highly beneficial, significantly increasing customer foot traffic, property values, and long-term public support.

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In general the pedestrianised area in Aarhus is pretty extensive. However the municipality is continuously getting requests from local resident associations to pedestrianise their streets. Often the streets have many cafes and shops with curbside parking and therefore see a lot of traffic. However in many cases the need for resident parking is hard to overlook and therefore the pedestrian area has not been expanded for some years.

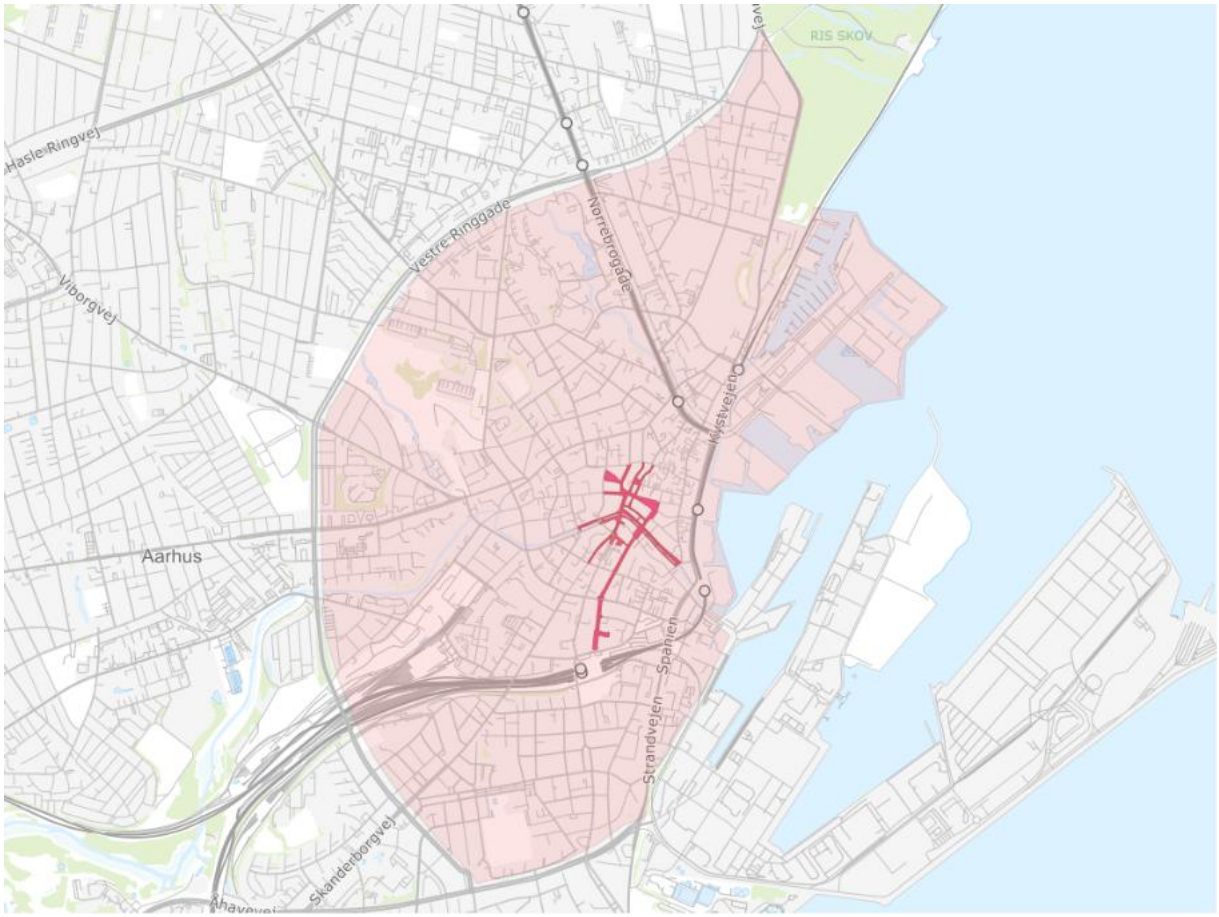


Figure 9:Within the Low Emission Zone (bright red), a pedestrian zone (dark red) is established, facilitating a network of car-free walkable shopping streets

Timespan for logistics

To mitigate some of the challenges with imposing car restrictions on the city centre by creating a pedestrian zone, The Municipality of Aarhus has established a time window from 04-11 am where trucks and delivery vans are allowed to drive and deliver goods in the pedestrian zone. Regulation is technically facilitated by the police, however primarily by using strategically placed retractable bollards. Outside the restricted time window, the designated offloading sites (outside pedestrian area), cargo bike or walkable delivery is permitted.

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While Aarhus has implemented various measures including a Low Emission Zone, delivery time restrictions and dedicated loading bays, these measures were largely developed individually over time and not as part of an overarching logistics strategy. The development of the SULP therefore aims to create a coherent framework that aligns freight management with climate objectives, urban liveability goals and economic competitiveness.

A further challenge is stakeholder coordination. Urban logistics involves multiple actors, including transport operators, retailers, developers, residents, infrastructure providers and public authorities. Their objectives are often different and occasionally conflicting. Aarhus has joined DISCO also to learn from other European cities on how to establish productive collaboration models with the sector.

4.3 Links with other projects and initiatives

Aarhus has a long tradition of participating in national and European projects related to sustainable mobility, climate action and urban development. These activities have provided the municipality with valuable experience in stakeholder engagement, data-driven planning and the testing of innovative mobility solutions. The city's participation in DISCO builds upon this foundation and supports the ongoing development of Aarhus' Sustainable Urban Logistics Plan (SULP), which aims to establish a long-term framework for freight and logistics planning. Even though, historically the projects have been majorly connected to urban planning and general mobility, logistics and transport have been included in the focus in recent years.

Prior to and during DISCO, Aarhus has been involved in several initiatives addressing urban logistics and sustainable freight transport. Most notably, the municipality participated in the URBANE project, which focused on innovative last-mile delivery solutions, urban micro-consolidation centres and cargo-bike logistics. Through URBANE, Aarhus has explored how microhubs can reduce traffic congestion and emissions while supporting efficient parcel distribution in dense urban environments.

In parallel, Aarhus has worked on a number of local initiatives that contributed directly to the future SULP, including:

- Sensor-based monitoring of truck loading and unloading zones.
- Development of concepts for low-noise and night-time deliveries.
- Analysis of charging infrastructure requirements for freight vehicles.
- Data collection and evidence-based management of curbside space.

In addition to URBANE, the NEXTLOGIC project provides important inspiration for Aarhus' future work on urban logistics. NEXTLOGIC focuses on creating more efficient and sustainable freight transport systems through improved cooperation between public authorities, logistics operators

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and infrastructure managers. One of the key lessons from NEXTLOGIC is the importance of viewing freight transport as an integrated system rather than a collection of isolated measures.

Together, URBANE, NEXTLOGIC and DISCO provide Aarhus with a comprehensive knowledge base that combines operational logistics innovation, governance approaches and data-driven planning methodologies. While URBANE contributed practical experience with consolidation centres and cargo-bike logistics, NEXTLOGIC highlights the importance of integrated logistics governance, and DISCO provides direct implementation learning through its twinning methodology and DISCOCURB demonstrations. Collectively, these initiatives support Aarhus' transition towards a more sustainable, efficient and evidence-based urban freight system and provide a strong foundation for the implementation of the future SULP.

In parallel to the three EU innovation projects, Aarhus also participates in the GLEAM Interreg project, which fucuses on green transition in SME's within the craftsman sector. The project is based on the development on physical network with the craft associations and their members and the co-creation or development of a green transition.

4.1.4 Main learnings from the Webinar Series and the DISCO project

Aarhus has used its participation in DISCO as a stepping stone for the development of the forthcoming Sustainable Urban Logistics Plan (SULP). While the city has previously explored innovative logistics solutions through initiatives such as URBANE and local mobility projects, DISCO has provided a structured framework for learning from other European cities and translating their experiences into concrete actions for Aarhus.

A central element of this knowledge transfer has been the DISCO Twinning Methodology, which enables follower cities to learn directly from the experiences, successes and challenges of the Starring Living Labs in Copenhagen, Helsinki, Ghent and Thessaloniki. Through workshops, webinars, bilateral exchanges and replication activities, Aarhus has gained insights into how innovative logistics measures can move from concept to implementation. The twinning approach has been particularly valuable because it focuses not only on technology, but also on governance models, stakeholder engagement etc, which makes the approach more holistic.

As part of the twinning activities, Aarhus has been particularly inspired by the DISCOCURB concept, which was demonstrated in Copenhagen, Helsinki, Padua and Zaragoza Living Labs. These pilots used sensor technologies, floating car data, occupancy monitoring and digital management tools to better understand how loading and unloading spaces are used and how curbside infrastructure can be managed more effectively.
The data-driven curbside management approach can provide valuable insights into delivery patterns and parking behaviour, thus creating a stronger evidence base for future urban logistics planning in Aarhus.

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For Aarhus, the DISCOCURB aligns closely with several priorities already identified during the SULP development process. The municipality is currently exploring sensor-based monitoring of truck loading bays and the potential introduction of bookable loading and unloading spaces. Drawing on the lessons from Copenhagen and Helsinki, Aarhus plans to adopt elements of the DISCOCURB approach to improve the understanding of how freight-related curbside space is used in selected parts of the city. This will support more evidence-based decision-making and help optimise the allocation of limited urban space between freight operators, residents and other users. The plan is to develop a bookable system for on/offloading zones in the city centre.

The implementation of a DISCOCURB-inspired approach is expected to generate several benefits

- Improved knowledge of loading and unloading behaviour.
- Better utilisation of existing freight infrastructure.
- Enhanced planning of future loading zones.
- Reduced conflicts between freight activities and other road users.
- Stronger data foundations for the future SULP.

Beyond the technical aspects, the twinning process has reinforced the importance of collaboration between municipalities, logistics operators and technology providers. Experiences from the DISCO Living Labs demonstrated that successful implementation depends not only on infrastructure and data, but also on building trust, sharing information and cooperation across stakeholders. These lessons are highly relevant for Aarhus as the city seeks to establish new partnerships around urban logistics and sustainable freight solutions for example through a new working group for urban freight.

Together with experiences from the URBANE project, especially regarding urban microhubs and cargo-bike deliveries, the DISCO twinning activities provide Aarhus with a solid foundation for future logistic projects. Aarhus therefore intends to use the lessons learned from DISCOCURB and the broader twinning methodology as key building blocks in the implementation of its SULP and in the development of more sustainable, efficient and data-driven urban freight systems.

4.1.5 Rationale of solutions chosen

Aarhus has identified data-driven curbside management through the DISCOCURB concept as the most relevant solution to replicate because it directly addresses several of the city's current urban freight and logistics challenges. While Aarhus already has designated loading zones, delivery time restrictions, a pedestrianised city centre and a Low Emission Zone, there is currently limited knowledge about how loading and unloading infrastructure is actually used in practice. Decisions regarding freight operations and curbside space allocation have therefore often been based on stakeholder feedback and observations rather than comprehensive operational data.

The development of a Sustainable Urban Logistics Plan (SULP) has highlighted the need for a stronger evidence base to support future logistics policies and investments. Through the DISCO

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twinning activities, Aarhus learned from the experiences of Copenhagen and Helsinki, where DISCOCURB demonstrated how sensors, occupancy monitoring and digital curbside management tools can generate detailed knowledge about freight movements and loading zone utilisation. These experiences showed that better data can lead to better planning decisions and more efficient use of limited urban space. Beside sensor monitoring, Aarhus furthermore aims to obtain connected truck data, which will help to understand where trucks are stopping and therefore where future on/offloading zones should be placed.

The solution also aligns closely with Aarhus' broader mobility and sustainability objectives. The municipality aims to reduce congestion, improve urban liveability and support the transition towards low-emission transport systems. Better management of freight operations contributes directly to these goals by enabling more efficient deliveries, reducing unnecessary circulation of delivery vehicles searching for available loading spaces and creating a more balanced use of public space.

4.6 SWOT Analysis

Strengths	Weaknesses
• Strong political commitment to sustainable mobility. • Existing experience with pedestrianisation and low-emission initiatives. • Ongoing SULP development process. Existing dialogue with logistics operators and freight stakeholders.	• Aarhus currently lacks comprehensive freight and curbside data. • Limited local experience with digital curb management systems. • Uncertainty regarding long-term operation and maintenance costs. • Potential resistance from users if curbside regulation becomes more restrictive.

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Opportunities	Threaths
• Replication of DISCOCURB solutions tested in Copenhagen and Helsinki. • Collection of evidence for future SULP measures and investments. • Better utilisation of existing loading bays and curbside infrastructure. • Creation of a digital foundation for future microhubs, booking systems and Zero Emission Zones. Potential integration with smart city and digital twin initiatives.	• Data sharing barriers among private logistics operators. • Delays in procurement, technology deployment or regulatory approvals. • Funding uncertainties. • Limited stakeholder engagement may reduce usefulness of collected data. Competition for urban land and public space

Table 2: Aarhus' SWOT analysis

Strengths

The Municipality of Aarhus already shows a strong political commitment towards sustainable mobility, e.g. in the ambitious Green Mobility Plan. Aarhus both has had and currently has different pedestrianisation and low-emission initiatives, providing the municipality with valuable experience regarding sustainable mobility and logistics practices. As the SULP is currently in the process of development, the SULP and logistic initiatives can develop parallel to each other, ensuring that one is aligned with the other. Additionally, Aarhus Municipality facilitates and partakes in ongoing dialogue with logistics and freight stakeholders operating within the municipality through a freight and logistics network, providing input from the parties affected by the different initiatives and allowing for them to feel heard by Aarhus Municipality.

Weaknesses

Currently, Aarhus lacks comprehensive freight and curbside data while also having limited local experience with digital curb management systems. Here, additional data is needed, and the associated costs for obtaining such data, and for establishing and maintaining a digital curb management system, is as of yet uncertain. While balancing the needs of all users of the limited space of the inner city of Aarhus, resistance can develop from users if curbside regulations become more restrictive.

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Opportunities

The DISCOCURB solutions tested in Copenhagen and Helsinki can possibly be replicated in Aarhus, and drawing on the experience from the two cities can ease the development and implementation of similar solutions in Aarhus. Data and evidence of usefulness can be collected for future SULP measures and investments, and the loading bays and curbside infrastructure already existing and in use can be better utilised. The creation of a digital curb management system can create the foundation for future initiatives such as microhubs, other booking systems, and Zero Emission Zones. Obtaining connected truck data feeds into the narrative of creating a digital twin of the logistics operations in Aarhus. The twinning platform will help understand the existing system and plan for future optimisation.

Threats

Private logistics and freight operators possibly hold some reluctance towards sharing their data, as it can be a competitive advantage. Here, limited engagement from the relevant stakeholders may also reduce the usefulness of such collected data. Regulatory approvals can be delayed, as can the procurement and deployment of the technology of choice, and funding for the procurement, deployment and maintenance of hardware and digital systems is uncertain. Finally, Aarhus Municipality must balance the needs and wants of all users for the limited urban land and public space, between which there often is competition for the available space in the city.

Implementation roadmap

Phase	Activity	Outcome
Phase 1	Build on the DISCO twinning activities with Copenhagen and Helsinki. Review lessons learned from the DISCOCURB implementations, engage local logistics operators and businesses, identify priority loading zones, and establish baseline data on curbside usage in Aarhus.	Clear understanding of local freight challenges, stakeholder needs and opportunities for replicating DISCOCURB in Aarhus.
Phase 2: DISCOCURB Pilot Implementation	Deploy sensor-based monitoring and data collection at selected loading and unloading zones. Test occupancy monitoring, analyse loading behaviour and assess opportunities for smart management of curbside space. Evaluate	Evidence-based insights into freight operations, utilisation of loading zones and opportunities for improved curbside management.

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and Evaluation (2026-2027)	results together with logistics operators and other stakeholders.	
Phase 3: SULP Integration and Scaling (2027 onwards)	Integrate findings into the Aarhus SULP and develop policies for loading zones, smart curbside management and future logistics initiatives. Explore expansion towards bookable loading bays, digital curb management and future Zero Emission Zone measures.	A city-wide, data-driven urban logistics framework supporting sustainable freight transport and future logistics innovation in Aarhus.

Table 3: Aarhus' implementation roadmap

4.7 Next steps

The DISCO project has provided Aarhus with a solid foundation for developing a more sustainable, data-driven and collaborative approach to urban logistics. The key legacy of the project will be the integration of the lessons learned into the forthcoming Sustainable Urban Logistics Plan ensuring that freight transport becomes an integrated part of the city's broader mobility, climate and urban development strategies.

The municipality will continue strengthening collaboration with logistics operators, retailers, businesses and other stakeholders. One of the main lessons from DISCO is that successful urban logistics solutions depend as much on cooperation and governance as on technology. Aarhus therefore plans to establish a more structured dialogue with the freight sector to support future implementation and ensure that solutions are developed jointly with the actors responsible for daily freight operations.

The purchase of connected truck data will facilitate a twinning approach that can be used in understanding the current system and challenges and therefore facilitate future planning approaches.

The knowledge generated through DISCOCURB and future pilot projects will support a range of long-term ambitions, including smarter curbside management, freight electrification, urban microhubs, cargo-bike logistics and potentially future Zero Emission Zone measures. Aarhus will adopt a phased implementation approach, where pilot projects are used to test concepts, collect data and evaluate impacts before larger investments are considered.

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4.2 North Hesse

4.2.1 Background and geographical context

Kassel is the main urban centre of North Hesse and recorded 207,622 residents in the municipal population register at the end of 2025[1]. The study focuses on the functional city-centre area rather than on one street or a pre-selected pilot location. This is appropriate because delivery routes, parking pressure, pedestrian areas, retail functions, cultural destinations and public transport connections interact across the centre.

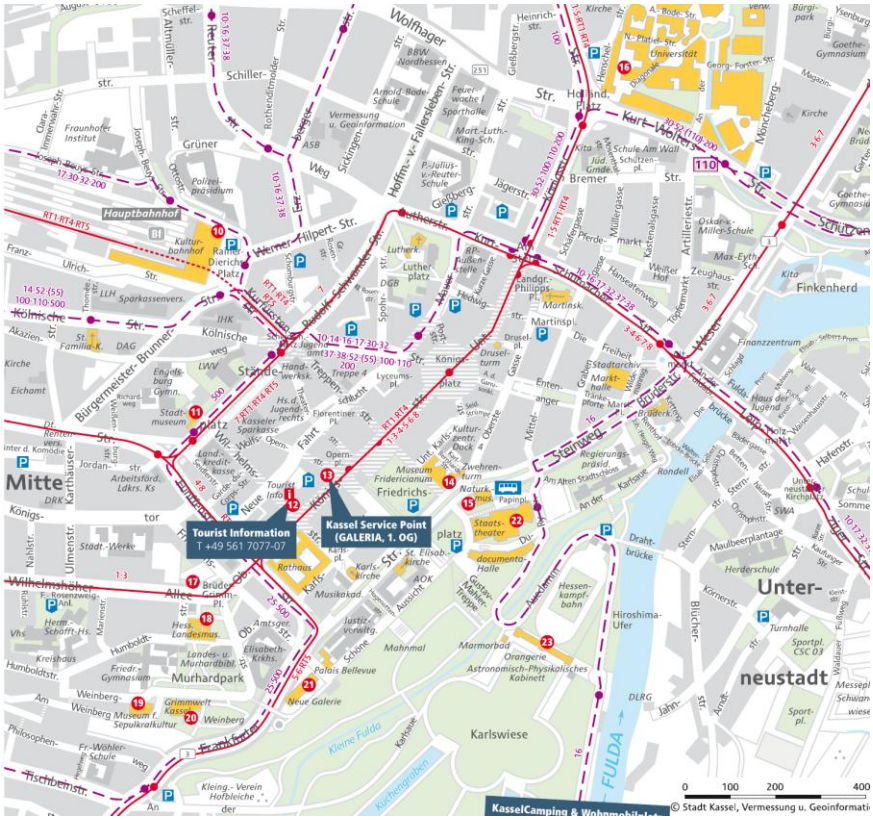


Figure 10: Kassel city centre and surrounding central area (orientation map). Source: City of Kassel, Stadtplan Kassel 2024; crop adapted for this study[2].

[1] City of Kassel. Kasseler Zahlen im Überblick - population data, status 31 December 2025. https://www.kassel.de/daten-und-karten/statistik/ueberblick.php

[2] City of Kassel. Stadtplan Kassel 2024 (visitor map). https://www.kassel.de/einrichtungen/gaeste/infomaterial/Stadtplan-Kassel-2024_DIN-A3.pdf

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The City of Kassel describes the Mitte district as the city centre with historic buildings, cultural institutions, shops, department stores, shopping galleries, service providers and public facilities. Mitte is also a residential area with 8,631 residents on 1.94 km² as of 31 December 2025[3]. This mix of retail, services, public functions and housing creates different types of delivery demand within a compact urban area.

The functional study area follows the broader logic of Kassel's city-centre concept. It includes the main shopping area from the Rathaus towards the Stern/Holländischer Platz area, the corridor from the Kulturbahnhof towards the Fulda, and the transitions to adjacent inner-city neighbourhoods[4]]. This wider boundary is more useful for logistics than a strict administrative district line because delivery routes, parking facilities and potential off-street assets cross neighbourhood boundaries.

The city-centre concept sets a broader urban-development direction centred on multifunctionality, public-space quality, accessibility and integrated development. It also treats mobility, retail, services, culture, housing and climate as connected topics[5]. Urban logistics measures therefore need to improve delivery reliability without simply transferring problems to pedestrians, public transport, cycling or residential streets.

The study area combines several logistics-relevant demand generators in a compact area: the central retail and service locations around Königsplatz and Friedrichsplatz, the pedestrianised and mixed-use core, the Kulturbahnhof/Hauptbahnhof access area, cultural destinations and city-centre parking facilities. These functions are not treated as predefined pilot sites; they provide the urban context for screening loading-zone pressure, delivery patterns and potential off-street assets.

Kassel has an established integrated transport-planning basis. The Kassel Transport Development Plan 2030 (Verkehrsentwicklungsplan Kassel 2030, VEP 2030) was adopted in 2015 and covers walking, cycling, buses, trams, rail, private cars and commercial traffic in an integrated mobility strategy[6]. A stand-alone Sustainable Urban Logistics Plan (SULP) was not identified in the public desk review. For this feasibility study, the City Logistics Concept and the existing integrated mobility-planning framework serve as the most relevant local planning basis.

[3] City of Kassel. Mitte. https://www.kassel.de/buerger/bauen_und_wohnen/stadtteile/mitte/mitte.php

[4] City of Kassel. Eine Neue Vision - Innenstadtkonzept / KASSELmachtZUKUNFT. https://www.kassel.de/buerger/bauen_und_wohnen/projekte-und-entwicklung/inhaltsseiten/ziz-kassel-macht-zukunft/inhalt/neue-vision.php

[5] City of Kassel. Eine Neue Vision - Innenstadtkonzept / KASSELmachtZUKUNFT. https://www.kassel.de/buerger/bauen_und_wohnen/projekte-und-entwicklung/inhaltsseiten/ziz-kassel-macht-zukunft/inhalt/neue-vision.php

[6] City of Kassel. Verkehrsentwicklungsplan Kassel 2030. https://www.kassel.de/buerger/verkehr_und_mobilitaet/verkehrsentwicklungsplan/verkehrsentwicklungsplan.php

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Indicator	Available evidence	Relevance for the feasibility study
City scale	207,622 residents in Kassel at 31 December 2025[7].	Confirms Kassel's role as the main urban centre and service hub of North Hesse.
Central district	Mitte: 8,631 residents on 1.94 km² [8].	Dense mixed-use context with retail, services, culture, public functions and housing.
Last-mile intensity	Approx. 10 CEP vehicles and 480 individual stops per day in postcode area 34117, based on 2019 shipment data cited in the City Logistics Concept[9]].	Useful scale indicator, but not a substitute for a current baseline survey.
Loading-space challenge	Only a small number of areas are explicitly dedicated to loading; misuse reduces availability and can lead to second-row, footway or cycleway stopping[10].	Direct local justification for DISCOCURB and a loading-zone baseline.
Existing parking assets	Seven listed city-centre parking facilities provide 2,658 spaces in total and are shown with live occupancy information by the City of Kassel[11].	Potential starting point for off-street asset screening; these are not automatically suitable logistics sites.
Stakeholder evidence	Project advisory board, nine expert interviews and two	Provides a published local evidence base for barriers, priorities and implementation conditions.

[7] City of Kassel. Kasseler Zahlen im Überblick - population data, status 31 December 2025. https://www.kassel.de/daten-und-karten/statistik/ueberblick.php

[8] City of Kassel. Mitte. https://www.kassel.de/buerger/bauen_und_wohnen/stadtteile/mitte/mitte.php

[9] City of Kassel. Logistikkonzept Kassel. Berlin / Wiesbaden, 2024. https://www.kassel.de/buerger/verkehr_und_mobilitaet/wirtschaftsverkehr-und-city-logistik.php.media/189228/Logistikkonzept_Kassel_Textfassung_2024-06-28_mit_Vorwort.pdf

[10] See above.

[11] City of Kassel. Parken in der Kasseler Innenstadt. https://www.kassel.de/buerger/verkehr_und_mobilitaet/mit-dem-auto/inhaltsseiten/parkhaeuser-parkplaetze-innenstadt.php

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	workshops documented in the City Logistics Concept[12].	

Table 4: Indicators and their relevance for the feasibility studies

What is already known	What still needs to be verified before a pilot
• Published Kassel City Logistics Concept and stakeholder process • Approx. 480 courier, express and parcel (CEP) stops per day in postcode area 34117, based on 2019 data • Limited number and reported misuse of loading areas • Existing city-centre parking facilities and live occupancy data • Local measures on loading zones, micro-hubs, parcel stations and reuse of existing space	• Complete digital inventory of loading areas • Current occupancy, dwell time and misuse by time of day • Operator demand and willingness to use booking systems • Legal and technical suitability of shortlisted locations • Operating model and cost estimates for a locker or micro-hub

Table 5: What still needs to be verified before a pilot

4.2.2 Current urban freight and logistics challenges

Core challenge: scarce and insufficiently managed urban space

The issue in Kassel is less about finding one new technology and more about making existing space reliable for deliveries. The City Logistics Concept states that only a small number of areas are explicitly designated for loading and delivery traffic. In central areas, high parking pressure and competition for space make loading difficult; misuse of existing zones further reduces availability. When suitable stopping space is unavailable, delivery vehicles may stop in the second row or on footways and cycleways, creating safety and traffic-flow conflicts[13].

The same concept shows that this is not a new or purely theoretical concern. Local stakeholders regarded loading zones as an important measure and asked for more flexible loading opportunities. The concept recommends proactive provision of loading zones, digital recording of all zones and, as

[12] City of Kassel. Logistikkonzept Kassel. Berlin / Wiesbaden, 2024. https://www.kassel.de/buerger/verkehr_und_mobilitaet/wirtschaftsverkehr-und-city-logistik.php.media/189228/Logistikkonzept_Kassel_Textfassung_2024-06-28_mit_Vorwort.pdf

[13] City of Kassel. Logistikkonzept Kassel. Berlin / Wiesbaden, 2024. https://www.kassel.de/buerger/verkehr_und_mobilitaet/wirtschaftsverkehr-und-city-logistik.php.media/189228/Logistikkonzept_Kassel_Textfassung_2024-06-28_mit_Vorwort.pdf

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a possible later step, information on availability and digital booking or reservation[14]. This closely matches the logic of DISCOCURB.

Operational consequences

The local challenge has several connected parts. First, the city does not yet have a complete digital picture of where loading space is available and how it is used throughout the day. Second, the estimated intensity of parcel delivery in the central area is high: the City Logistics Concept calculated around 480 CEP stops per day in postcode 34117 based on 2019 shipment data[15]. Third, any future locker or micro-hub solution would need a legally usable location, an operator, a clear demand case and a practical relationship with existing delivery routes. These issues are connected, which is why the study recommends a phased approach rather than a technology-first solution.

Existing local stakeholder evidence and priorities

The stakeholder process behind the Kassel City Logistics Concept provides the main local consultation basis for this study. Across the nine interviews, the authors report a largely consistent picture of the main challenges. The resulting priorities included reducing logistics traffic through consolidation, creating more and more flexible loading zones or parking permissions, strengthening municipal governance and developing clearer rules for loading space, delivery times and vehicle access[16].

The two workshops added operational perspectives from logistics service providers, trade representatives and craft businesses. They were used to test measures against local needs and to improve mutual understanding between the City and economic actors[17]. For DISCO, the important point is that Kassel already has a documented local dialogue. The feasibility study can therefore focus on transferability and on identifying what still needs to be measured or agreed before implementation.

Stakeholder landscape for a future pilot

A future pilot would require a smaller and more implementation-oriented stakeholder group than the broader process used for the City Logistics Concept. The matrix below is indicative: it reflects likely roles at feasibility stage and should be validated during pilot preparation. The City of Kassel is the central decision-making partner for public space, traffic regulation and loading-zone changes.

[14] See above.
[15] See above.
[16] See above.
[17] See above.

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Logistics operators are essential for operational testing, while Regionalmanagement Nordhessen, MoWiN.net and the IHK can support coordination and access to businesses.

Stakeholder	Influence	Interest	Likely role in a future pilot
City of Kassel	High	High	Public-space and traffic regulation; loading-zone planning and approval; coordination of municipal functions.
Logistics / CEP operators	Medium-High	High	Primary users; operational requirements; testing; selected data sharing.
Regional management Nordhessen (RMNH)	Medium	High	Regional strategy, coordination, funding screening and links to wider innovation initiatives.
MoWiN.net	Medium	High	Access to logistics and mobility companies; practical feedback; market dialogue.
Kassel-Marburg Chamber of Commerce and Industry (IHK Kassel-Marburg)	Medium	Medium-High	Business perspective and link to retail, services and commercial users.
Property / parking operators	Medium	Medium	Potential off-street assets for lockers, micro-hubs or temporary logistics functions.
Retail / gastronomy / services	Medium	Medium-High	Delivery demand, practical requirements and local acceptance.
Technology providers	Medium	Medium	Sensors, booking systems, signage, data interfaces and maintenance.
Residents / visitors	Medium	Medium	Public-space quality, acceptance and feedback on local impacts.

Table 6: List of interested stakeholders

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Figure 11: Indicative stakeholder landscape for a future Kassel pilot. Study team assessment based on stakeholder roles documented in the Kassel City Logistics Concept and the institutional roles considered in this feasibility study.

4.2.3 Links with local, regional and European projects and initiatives

Kassel City Logistics Concept as the main local reference

Kassel is not starting from zero. The 2024 City Logistics Concept is the main local anchor and already combines data analysis, stakeholder engagement and a catalogue of implementation-oriented measures. The city-centre concept adds a broader spatial and participation framework, including city walks, an online survey, a Zukunftswerkstatt workshop, a round table with inner-city businesses and a measures workshop[18]. DISCO can therefore build on existing local work instead of creating a parallel planning process.

[18] City of Kassel. Eine Neue Vision - Innenstadtkonzept / KASSELmachtZUKUNFT. https://www.kassel.de/buerger/bauen_und_wohnen/projekte-und-entwicklung/inhaltsseiten/ziz-kassel-macht-zukunft/inhalt/neue-vision.php

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No.	Measure	Short term 0-1 year	Medium term 1-3 years	Long term 3-5 years	Main action field
M6	Further development of delivery and loading areas		•		Regulation, planning and prioritisation
M7	Space exchange for parking facilities, parking areas and existing properties	•			Regulation, planning and prioritisation
M8	Integration of logistics functions into land-use planning		•		Regulation, planning and prioritisation
M9	Coordination and communication	•			Regulation, planning and prioritisation

Table 7: Existing Kassel City Logistics Concept measures relevant to the DISCO feasibility study: M6-M9, translated and recreated as an editable table. Source: City of Kassel, Logistikkonzept Kassel.

The City Logistics Concept is the main local reference. It already includes measures on micro-hubs, parcel stations, loading and transport areas, a space exchange and logistics functions in land-use planning[19]. The city-centre concept adds a broader urban-development perspective: less through-traffic, better use of parking facilities and a higher-quality public realm[20]. The VEP Kassel 2030 provides the wider integrated mobility context[21].

The public Geoportal and city-centre parking information are also relevant. They do not provide a finished urban-freight database, but they offer a starting point for a later asset inventory and for checking how parking-related infrastructure might be assessed[22] [23].

[19] City of Kassel. Wirtschaftsverkehr und City-Logistik. https://www.kassel.de/buerger/verkehr_und_mobilitaet/wirtschaftsverkehr-und-city-logistik.php

[20] City of Kassel. Eine Neue Vision - Innenstadtkonzept / KASSELmachtZUKUNFT. https://www.kassel.de/buerger/bauen_und_wohnen/projekte-und-entwicklung/inhaltsseiten/ziz-kassel-macht-zukunft/inhalt/neue-vision.php

[21] City of Kassel. Verkehrsentwicklungsplan Kassel 2030. https://www.kassel.de/buerger/verkehr_und_mobilitaet/verkehrsentwicklungsplan/verkehrsentwicklungsplan.php

[22] City of Kassel. Geoportal Kassel. https://www.kassel.de/daten-und-karten/geoportal-kassel.php

[23] City of Kassel. Parken in der Kasseler Innenstadt. https://www.kassel.de/buerger/verkehr_und_mobilitaet/mit-dem-auto/inhaltsseiten/parkhaeuser-parkplaetze-innenstadt.php

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At European level, the strongest practical references are Padua, Helsinki, Copenhagen, Thessaloniki and Zaragoza. They are not templates to be copied directly. They show, however, that cities make better progress when they start with the local problem, use existing space where possible and keep the first test manageable.

4.2.4 Main learnings from DISCO and the webinar series

Padua: dynamic lockers need reliable curb access

Padua is the closest transfer case for Kassel. The Padua twinning living lab combines DISCOPROXI and DISCOCURB. A locker is installed on an electrically powered modular NEXT pod. Users receive a code and collect parcels from the mobile unit. Unlike a fixed locker, the pod can move to locations where demand arises[24].

For Kassel, the key transfer lesson is not that mobile lockers should be purchased immediately. It is that proximity-logistics solutions require reliable, legally usable curb access, clear operating rules and a data basis for selecting the right locations.

The Padua experience also shows why dynamic lockers cannot be analysed in isolation. A mobile locker needs a legally and operationally reliable place to stop. Normal parking cannot be assumed to be available, while conventional loading zones may have strict time limits. Padua therefore introduced on-demand loading and unloading zones that can be reserved in advance through a public web application. Bookings are linked to vehicle licence plates, variable message signs communicate authorised use, and municipal workflows support enforcement[25].

Padua also offers four very concrete reminders for Kassel. Dynamic lockers are part of a wider operating system, not standalone street furniture. Its first pilot was deliberately limited to three locations. The early delivery results are useful as a learning example but not as a forecast for Kassel. And because illegal occupation of loading zones continued to occur, rules, communication and enforcement have to be considered from the start.

[24] DISCO Webinar Series for Follower Sites, 1st Webinar - DISCOCURB, 27 October 2025. Includes Padua, Helsinki and Copenhagen learning cases.
[25] See above.

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Helsinki and Copenhagen: relevance for a Kassel baseline and smart-curb pilot

Helsinki tested battery-based monitoring solutions for loading zones and used Floating Car Data to identify stopping patterns and potential locations for new zones. A key lesson was to align the pilot with the city's current planning needs and to use market dialogue to refine the technical approach[26].

Copenhagen tested two smart zones with sensors, signage and a booking application. The pilot showed that onboarding campaigns influenced sign-ups and that actual booking patterns differed by day and time. Sixty per cent of users completed deliveries within 15 minutes, while a smaller group required substantially longer slots[27] [28].

For Kassel, these examples support a deliberately low-threshold first step. Temporary or battery-based monitoring could be used at a small number of loading areas without committing immediately to a permanent city-wide platform. The Copenhagen experience also shows that operator onboarding, communication and booking rules need to be tested alongside the technology. These lessons are directly relevant to a possible DISCOCURB baseline and pilot-preparation process from 2027.

Thessaloniki and Zaragoza: relevance for screening existing spaces in Kassel

Thessaloniki tested the temporary and multipurpose use of buildings at the TIF HELEXPO exhibition centre and mapped underused infrastructure for integration into a shared space-availability observatory. The implementation work demonstrated the importance of early stakeholder engagement, data cleaning, clear access rights and iterative testing[29] [30].

Zaragoza provides a useful small-scale comparison. Its pilot micro-hub occupies a 15 m² municipal space in the San Vicente de Paúl Market and serves as a consolidation point for deliveries from the city's logistics platform. Deliveries are sorted and distributed with electric vehicles, cargo bikes and assisted carts. This illustrates that an initial micro-hub does not need to be a large warehouse[31].

For Kassel, the main transfer interest lies in screening existing off-street assets rather than constructing a new logistics facility. Parking-related spaces, underused ground-floor premises or well-connected transport-node environments could be examined through DISCOBAY and

[26] See above.
[27] DISCO Webinar Series for Follower Sites, 1st Webinar - DISCOCURB, 27 October 2025. Includes Padua, Helsinki and Copenhagen learning cases.
[28] DISCO Deliverable D4.2, Starring LL measures implementation, final version, 15 May 2025.
[29] DISCO Deliverable D4.2, Starring LL measures implementation, final version, 15 May 2025.
[30] DISCO Deliverable D4.3, Evaluation of impacts at Starring LLs, final version, 29 August 2025.
[31] DISCO LL Zaragoza Task 7.2 presentation, pilot micro-hub and mid-term analysis.

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DISCOESTATE. Zaragoza's 15 m² micro-hub also shows that a future pilot could begin at a very small scale, provided that access, operator responsibility and local demand are clearly defined.

Transfer principle for Kassel

Start with the local problem and the available space. Use DISCO as a modular toolbox. A Kassel pilot should combine only the elements required for a clearly defined local use case and should remain small enough to validate responsibilities, acceptance, data needs and operating costs.

4.2.5 Rationale for the proposed solution portfolio

The study does not recommend launching every DISCO solution at once. Kassel first needs a sound picture of the existing kerbside situation and of possible off-street assets. For that reason, DISCOCURB and DISCOBAY are the most suitable first steps. Lockers, proximity micro-hubs and the temporary use of existing buildings remain relevant, but they should follow only when there is a workable local use case rather than simply an attractive technology.

Local challenge	Measure	Short term 0-1 year
Scarce and contested loading space Limited evidence on occupancy and demand Potential off-street assets remain untested	DISCOCURB Data-based management of selected loading zones DISCOBAY Screening of existing assets and location types	DISCOPROXI Lockers or proximity micro-hubs DISCOESTATE Reuse of existing properties Only where location, operator and demand align
Expected outcome: a small, evidence-based pilot before any city-wide roll-out or major investment.		

Table 8: Proposed transfer logic for Kassel city centre. Source: Study team synthesis based on the Kassel City Logistics concept and DISCO project resources.

DISCOCURB is the preferred first pilot because it responds directly to the local problem of loading and unloading space. DISCOBAY should run alongside it as a structured search for suitable assets and location types. DISCOPROXI can become relevant for a locker, delivery point or proximity micro-hub where a viable operator and demand case exists. DISCOESTATE becomes useful when an existing property or parking-related space can avoid the need for new construction. DISCOLLECTION should stay proportionate: the first phase only needs enough data to understand local use and evaluate a pilot. The Meta Model Suite remains the common frame for checking readiness and making the steps comparable with other DISCO sites.

Location typology

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The location assessment should be staged. The first step is a typology. The second step is a shortlist of illustrative public-domain screening areas. A later pilot-preparation phase must verify ownership, access rights, operating conditions, electricity and data connectivity, accessibility, urban-design requirements and commercial interest.

The location typology should stay practical. Four types are worth screening first:

- Existing loading and unloading zones, especially around commercial streets and the edges of pedestrian-priority areas, where monitoring or booking may help.
- Publicly listed parking facilities, where opening hours, access, pedestrian proximity and ancillary space can be assessed without assuming a logistics use is already possible.
- Vacant or underused existing properties, which could later provide a small parcel point, handover area or temporary consolidation space if owners and operators are interested.
- Transport-node environments, including the Bahnhofsquartier and other well-connected locations, where footfall and public-transport responsibilities need to be considered carefully.

Illustrative locations: screening only

Public sources make it reasonable to include selected parking facilities and city-centre quarters in a later screening. For example, the municipal parking pages list city-centre facilities and provide live occupancy information. The Friedrichsplatz underground car park is directly connected to the pedestrian zone and includes charging facilities for electric cars and e-bikes[32] [33]. This does not mean that a logistics use is already feasible or approved. It means that parking facilities should be included in a structured screening process.

4.2.6 Qualitative SWOT analysis

The SWOT analysis focuses on the preferred initial pathway: DISCOCURB combined with DISCOBAY. Dynamic lockers, micro-hubs and the reuse of existing buildings remain relevant only where they meet the conditional criteria set out in this study.

[32] City of Kassel. Parken in der Kasseler Innenstadt. https://www.kassel.de/buerger/verkehr_und_mobilitaet/mit-dem-auto/inhaltsseiten/parkhaeuser-parkplaetze-innenstadt.php

[33] City of Kassel. Tiefgarage Friedrichsplatz. https://www.kassel.de/buerger/verkehr_und_mobilitaet/mit-dem-auto/inhaltsseiten/parken/tiefgarage-friedrichsplatz.php

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Strengths	Weaknesses
Strong local policy fit: the City Logistics Concept already identifies loading zones, micro-hubs, parcel stations, a space exchange and logistics functions in land-use planning. Published stakeholder evidence: project advisory board, nine expert interviews and two workshops provide a local evidence base. Clear European reference cases from Padua, Helsinki, Copenhagen, Thessaloniki and Zaragoza. Manageable first steps are possible before any large infrastructure investment.	No current freight-specific occupancy baseline exists for the selected city-centre areas. The available CEP estimate is based on 2019 shipment data and needs updating before impact evaluation. No operator-specific use case or business model has yet been selected. Responsibilities for public and private space, operations, data and enforcement still need to be clarified for a pilot.

Opportunities	Threats
Use the existing municipal planning momentum to create a visible, low-risk pilot. Turn the current data gap into a practical DISCOCURB baseline and monitoring exercise. Combine smart-curb management with later locker or micro-hub functionality where a real use case emerges. Screen existing parking facilities and properties before considering new construction. Use the City Logistics Concept and city-centre planning process as a bridge to longer-term urban-logistics policy.	Insufficient operator interest or an unclear business model may prevent implementation. Illegal occupancy and weak enforcement can undermine loading-zone pilots. Civil works, permissions, procurement or data-interface requirements can increase cost and delay implementation. A technology-first approach could create complexity without solving the local problem. Public acceptance may fall if logistics measures are perceived as taking space from other users without clear benefits.

Table 9: North Hesse's SWOT analysis

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Conditions for adoption

Space and access	Local demand	Rules and roles	Data and costs
Is there a location that can be used safely and legally, with realistic access for delivery vehicles and users?	Is there a clearly defined problem or use case that the pilot would address?	Who owns and manages the space, and how are permissions, enforcement and communication handled?	What is the smallest data set and budget required to determine whether the idea works?
A pilot should only be prepared once these four questions can be answered sufficiently.			

Table 10: A practical readiness check before moving from screening to a Kassel pilot. Source: Study team synthesis based on the adoption conditions discussed in this study

Before a pilot is proposed, Kassel should be able to answer four basic questions. Is there a space that can be used safely and legally? Is there a specific local demand or conflict that the pilot would address? Are roles, permissions and communication clear? And is there a small, realistic data and budget framework for testing the idea? A lead contact in the City of Kassel and a small working group with RMNH, MoWiN.net and the relevant municipal units would be sufficient for this first stage.

4.2.7 Strategic adoption plan

The adoption plan is intentionally modest. It is meant to help Kassel decide whether a small next step is worthwhile, not to prescribe a finished system. A good outcome from this study would be a shared view of which spaces should be examined first, what minimum evidence is needed, and which partners would need to be involved before any investment decision.

The first decision is not whether Kassel should buy a specific sensor, locker or software platform. It is whether the City and its partners want to build a small evidence base around selected loading areas and possible logistics-related assets. This is closely in line with measures M6-M9 in the Kassel City Logistics Concept.

Preferred pathway

The sequence below is indicative. It is intended to show dependencies rather than fixed delivery dates. In particular, the baseline and asset-screening work should not start before 2027 and should only proceed if the City of Kassel considers the next step useful.

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Confirm direction	Baseline and asset screening	Pilot preparation	Test and evaluate
After DISCO Confirm the study findings and agree the scope of a possible next step with the City of Kassel.	From 2027 Map loading areas and relevant assets; observe a small number of priority kerb areas.	After the baseline Discuss findings with operators; clarify governance, data, legal feasibility and budget.	If approved and funded Run a limited pilot, evaluate results and decide whether scaling or a proximity-logistics use case is justified.

Phase	Timing	Main activities	Expected output
0. Evidence consolidation and municipal alignment	After completion of the feasibility study	Confirm the findings of the study, keep the Kassel City Logistics Concept as the local policy anchor, and agree with the City of Kassel whether a baseline and asset-screening step should be taken forward.	Shared understanding of the scope and responsibilities for a possible next step.
1. Baseline and asset screening	From 2027	Create a simple digital inventory of loading areas and relevant location types; screen selected parking facilities and existing properties; observe a small number of candidate curb areas where this is useful; document rules, occupancy and misuse.	Shortlist of relevant areas, a basic evidence note and clearly defined data gaps.
2. Market dialogue and pilot preparation	Following the baseline and asset screening	Discuss findings with the City, selected logistics operators and relevant technology or property partners; decide whether a first pilot should focus on curb management only or include one clearly justified proximity-logistics use case; clarify legal, operational and budget questions.	A proportionate pilot concept with roles, data needs, legal checks and an indicative budget.
3. Small-scale pilot	Subject to a positive decision and	Test a limited number of monitored or bookable loading zones and, only if justified by the previous steps, one	Operational evidence, user feedback and practical

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	available funding	complementary locker or micro-hub use case.	implementation experience.
4. Evaluation and possible scaling	Following a sufficient period of pilot operation	Compare baseline and pilot findings; assess user acceptance, misuse, delivery reliability and governance; decide whether to expand, adapt or stop the measure.	A decision on possible scaling and an updated adoption pathway.

Table 11: Indicative adoption pathway for Kassel after DISCO. Source: Study team synthesis based on the strategic adoption plan in this study and the Kassel City Logistics Concept.

Minimum viable data set

A first pilot does not need a large data platform. It needs a usable baseline. At minimum, Kassel should know where the relevant loading areas are, what rules apply, and when they are observed to be occupied, underused or misused. If a booking system is tested, the City should also record reservations, duration, no-shows and user feedback. A locker or micro-hub case would require only a small additional set of operational information, such as likely delivery windows, vehicle types and the basic requirements of a potential operator. For off-street assets, ownership, access, security, opening hours and basic infrastructure are more important than a comprehensive database.

Indicative cost framework

At feasibility stage, cost information should be treated as an order-of-magnitude logic rather than as a budget. Kassel's City Logistics Concept notes that basic loading-zone measures can often be implemented through signage and markings without major civil works, while digital monitoring and booking add technology, integration and operating costs[34]. A comprehensive benchmark is Hamburg's SmaLa project, with a total project volume of EUR 2.12 million and EUR 1.06 million federal funding; this covered a multi-zone smart-loading programme and is not directly transferable to a small Kassel pilot[35].

[34] City of Kassel. Logistikkonzept Kassel. Berlin / Wiesbaden, 2024. https://www.kassel.de/buerger/verkehr_und_mobilitaet/wirtschaftsverkehr-und-city-logistik.php.media/189228/Logistikkonzept_Kassel_Textfassung_2024-06-28_mit_Vorwort.pdf

[35] Federal Ministry of Transport (Germany). Smarte Liefer- und Ladezonen - SmaLa. Project volume EUR 2,120,045; federal funding EUR 1,060,022; project period 2020-2024. https://www.bmv.de/SharedDocs/DE/Artikel/G/DKV/dkv-smala.html

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Measure	Indicative cost level	Main cost drivers	Feasibility-stage interpretation
Digital inventory and asset screening	Low to medium	Geographic information system (GIS) work, field observations, staff time or external support, data consolidation	Good first step; scope can be kept small and targeted.
Basic loading-zone designation / adjustment	Low to medium	Signage, markings, traffic orders and minor physical adjustments	The Kassel concept notes that major civil works are often unnecessary[36].
Monitoring of 2-4 loading zones	Medium	Sensors or cameras, installation, connectivity, dashboard and evaluation	Technology-neutral market dialogue is needed before selecting a solution.
Bookable smart-curb pilot	Medium to high	Booking platform, signage, interfaces, municipal workflow, enforcement and support	Start only after baseline data and legal / operational checks.
Static locker or small micro-hub in existing space	Medium to high / site-specific	Fit-out, access, security, power, rent or opportunity cost, operator model and operations	Use existing assets where possible; business model is more important than hardware alone.
Mobile dynamic-locker solution	High / uncertain	Vehicle or pod, locker module, software, operations, permissions and staffing	Consider only with a committed operator or technology partner and a clearly evidenced demand case.

[36] City of Kassel. Logistikkonzept Kassel. Berlin / Wiesbaden, 2024. https://www.kassel.de/buerger/verkehr_und_mobilitaet/wirtschaftsverkehr-und-city-logistik.php.media/189228/Logistikkonzept_Kassel_Textfassung_2024-06-28_mit_Vorwort.pdf

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Scaling to a multi-zone city system	High	Platform integration, wider sensor rollout, enforcement, maintenance, data governance and staffing	Requires separate investment case; Hamburg SmaLa provides only a broad benchmark[37].

Table 12: List of measures and their potential future implementation

The main cost lesson from the comparison cases is to avoid over-specification at feasibility stage. Padua, Copenhagen and Zaragoza all started with limited pilots, while Hamburg's much larger SmaLa benchmark shows how costs rise when multiple zones, digital booking, sensing, enforcement and system integration are combined. For Kassel, supplier quotations should only be requested after the baseline and shortlist are defined.

Potential funding routes

Funding should be screened once a pilot type is defined. Current Hessian innovation programmes include support for logistics and mobility innovation, and the Hessian electromobility programme can support eligible electric vehicles, charging infrastructure and feasibility studies under defined conditions[38] [39]. Other municipal, federal or European Union (EU) programmes may become relevant depending on whether the pilot focuses on digital curb management, climate action, public-space innovation or zero-emission logistics. Because calls and eligibility rules change, the adoption plan should treat funding as a pilot-preparation task rather than assume a specific programme will remain available.

4.2.8 Next steps and recommendations

Strategic recommendation

Use the existing Kassel City Logistics Concept as the local policy anchor and launch a focused baseline-and-pilot-preparation process. The first implementation decision should be limited to a small smart-curb pilot and a structured asset screening. Dynamic lockers and micro-hubs should remain explicit transfer options, but their deployment should depend on a validated use case, available space and an operator or technology partner.

[37] Federal Ministry of Transport (Germany). Smarte Liefer- und Ladezonen - SmaLa. Project volume EUR 2,120,045; federal funding EUR 1,060,022; project period 2020-2024. https://www.bmv.de/SharedDocs/DE/Artikel/G/DKV/dkv-smala.html

[38] Innovationsförderung Hessen. Elektromobilität. https://www.innovationsfoerderung-hessen.de/elektromobilitaet

[39] Innovationsförderung Hessen. Innovationen für Logistik und Mobilität. https://www.innovationsfoerderung-hessen.de/logistik-und-mobilitaet

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The published local evidence can be consolidated first. Any baseline or asset-screening work would start from 2027 and should proceed only if the City of Kassel considers the next step useful.

1. Consolidate the published local evidence and confirm the DISCOCURB + DISCOBAY transfer pathway as the preferred first stage.
2. From 2027, nominate a municipal contact and agree with the City of Kassel on the scope of any baseline and asset-screening work.
3. Prepare a simple asset-screening template for loading zones, parking facilities and existing properties.
4. Select a small number of loading-zone areas for baseline observations and a limited set of off-street asset types for screening.
5. Conduct a limited market dialogue with selected logistics operators, technology providers and, where relevant, property or parking operators after the shortlist has been defined.
6. Decide whether the first pilot should remain a curb-management pilot or include one clearly justified proximity-logistics use case.
7. Check legal feasibility, operating responsibilities, supplier quotations and funding eligibility before any procurement or binding contract is initiated.

A few practical principles follow from the DISCO examples. Start with the problem, the available space and a small set of indicators - not with a complex technology package. Choose a limited number of visible but manageable locations instead of a city-wide roll-out. Use existing properties and infrastructure where possible, but do not assume that a car park or vacant property is automatically suitable. Include permissions, signage, communication and enforcement from the beginning. Finally, keep the first data set purpose-oriented and avoid asking companies for sensitive operational data before there is a clear reason to do so.

A pilot should only move forward when five conditions are met: (1) a specific local problem and location are defined; (2) the City of Kassel confirms that the proposed use of space is legally and operationally feasible; (3) at least one relevant logistics or operating partner sees a practical benefit; (4) a minimum data baseline and evaluation plan are available; and (5) costs, responsibilities and funding are sufficiently clear for a small-scale test. These conditions are more important than selecting a specific technology at this stage.

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4.3 Piacenza

4.3.1 Background and geographical context

Geographical setting and strategic role

The Municipality of Piacenza (104,585 residents) is the westernmost province capital of Emilia-Romagna Region and is situated in a provincial area of approximately 2,586 km², with a total population exceeding 280,000 inhabitants. Thanks to its geographical location on the border of Lombardy, Piedmont and Liguria, the territory plays a pivotal role in linking the various economic and productive systems of northern Italy.The province extends along a complex topographical gradient that stretches from the Po Valley to the southern hills and Apennines, encompassing the main valleys of the Tidone, Trebbia, Nure, and Arda rivers, tributaries of the Po. In this context, the city of Piacenza, with an area of approximately 118 km² and a population of just over 100,000, occupies a strategic position relative to the major urban, industrial, and logistics hubs of northern Italy, many of which are within a radius of about 200 km.



Figure 12: Image produced by the Mobility Office – Infrastructure and Smart City Division

This location, combined with a well-developed infrastructure system, has over time fostered the region's specialization in the logistics and goods distribution sectors. Piacenza is, in fact, traversed by major transportation routes, such as the A1 (north-south) and A21 (east-west) highways, and is also served by the main national railway lines, including connections to the Milan–Bologna high-speed rail system. These characteristics make Piacenza's area one of the main logistics hubs in northern Italy.

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Figure 13: Image generated from Google Maps

Urban Layout and Transportation Infrastructure

The historic centre of Piacenza, characterized by a medieval urban layout, has a morphological configuration that significantly impacts the organization of mobility and, in particular, the management of urban freight distribution. The narrow road sections, the presence of historic buildings and arcades—elements of high architectural and identity value for the city—in fact limit the availability of space for traffic and parking. The road network was designed during historical periods when mobility needs were vastly different from those of today. It is now ill-suited to handle the traffic generated by the modern goods distribution system, which involves high volumes of deliveries and frequent commercial vehicle traffic.

The presence of Urban Pedestrian Areas (APU) and Controlled Traffic Zones (ZTL) is another factor, with division into sectors A, B, C, and D and active daily between 8:00 a.m. and 7:00 p.m., with electronic access control. While traffic restrictions ensure the protection of public space and the safety of the most vulnerable users, they also complicate the organization of loading and unloading operations.

The need to ensure a balance between accessibility for economic activities, residents' needs, the protection of pedestrian and bicycle mobility, and the proper management of deliveries makes it necessary to identify more efficient and flexible urban logistics management models.

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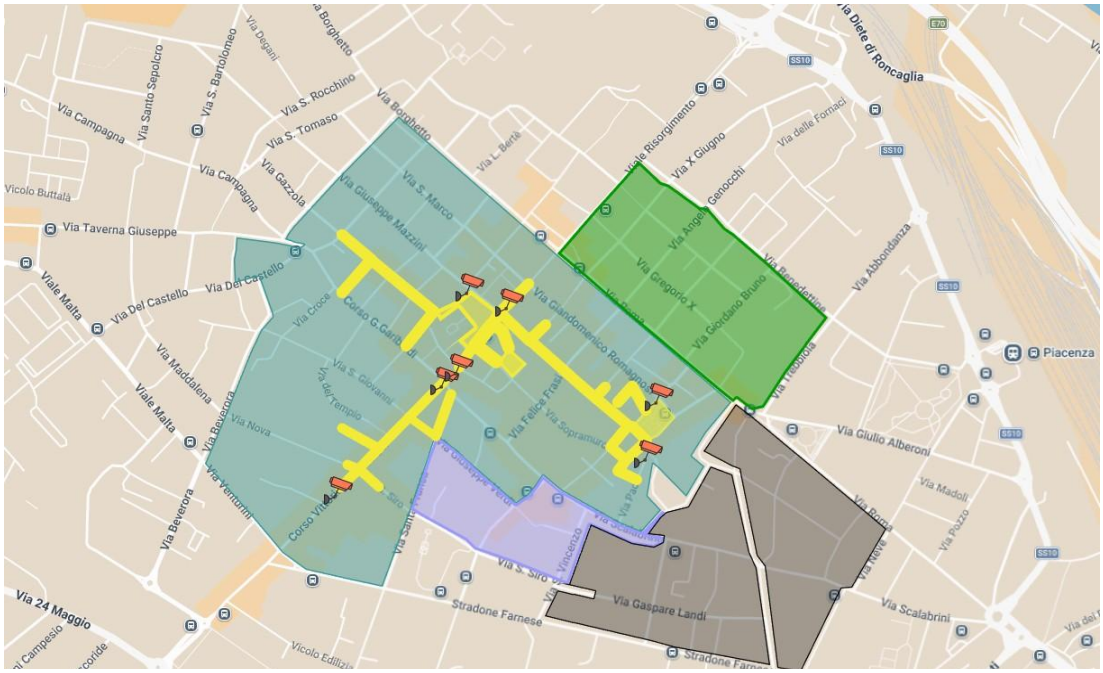


Figure 14: ZTL and APU Map – Municipality of Piacenza

Attraction hubs, traffic generators, commercial and industrial structure

In the urban context of Piacenza, the main attraction hubs play a decisive role in generating and concentrating goods flows, directly impacting the organization of last-mile logistics. Among these, a key element is the Guglielmo da Saliceto Hospital, centrally located and characterized by high daily logistics demands related to both medical supplies and ancillary services. Similarly, the presence of major university campuses, such as the Politecnico di Milano – Piacenza Campus and the Università Cattolica del Sacro Cuore – Piacenza Campus, generates constant flows related to educational, administrative, and service activities, with a growing demand for rapid and frequent deliveries.

Another strategic hub is the Piacenza railway station, which serves as an interchange hub for passengers and, indirectly, for logistics services related to urban mobility and commerce. The station is complemented by other attractions, such as the historic city centre with its high commercial density, school complexes, and large-scale retail facilities lining the main thoroughfares connecting suburban areas to the city centre and industrial zones.

The distribution of these attraction points across the urban area generates a complex and widespread demand for freight transport, often concentrated in areas characterized by limited accessibility or traffic congestion.

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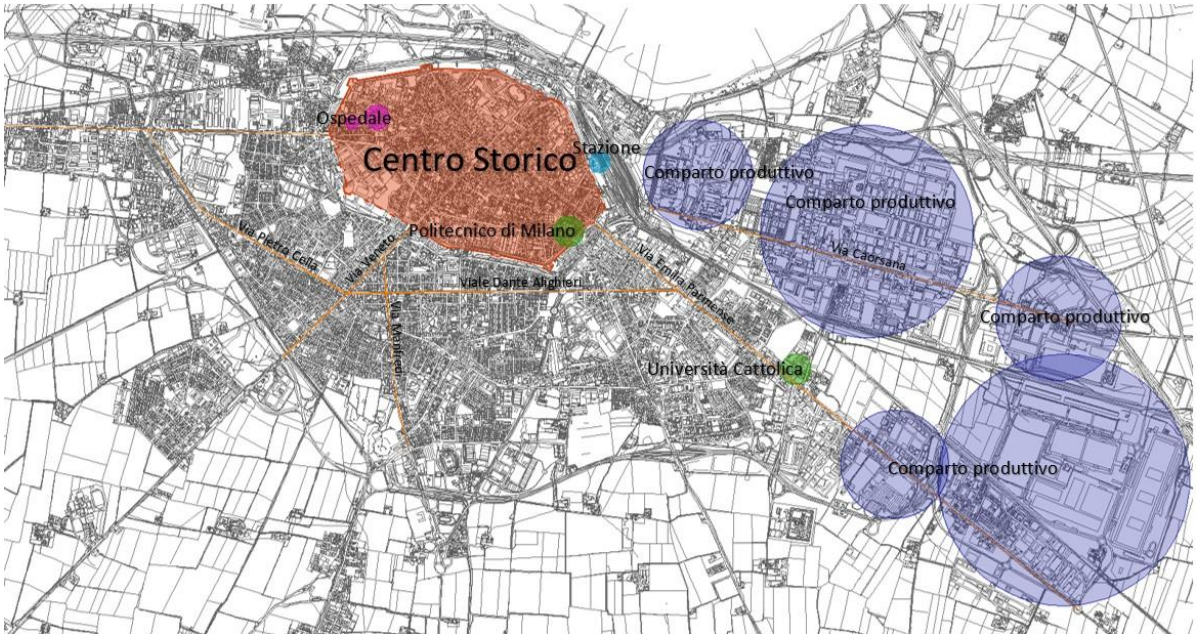


Figure 15: Attraction hubs. Image produced by the Mobility Office – Infrastructure and Smart City Division

The city's commercial structure is highly polarized. On the one hand, there is a marked concentration of large-scale retail chains along Via Emilia and in the southern area—areas that over the years have established a regional draw and capture a significant share of shopping traffic. On the other hand, the historic centre retains its own appeal, though it shows signs of fragility: approximately 24% of storefronts are currently vacant, highlighting a state of transition and the challenges faced by some traditional businesses. At the same time, a gradual decline in neighborhood commerce is observed in the districts, with a reduction in local shops that historically provided daily services to residents.

This configuration results in a complex distribution landscape: the historic centre sees frequent but fragmented deliveries linked to a multitude of small businesses; pressure from e-commerce is growing, introducing additional and less predictable flows; and the economic sustainability challenges facing traditional commerce are intensifying, as it must contend with increasingly competitive and digitized distribution models.

The city's urban fabric is characterised by a significant integration of productive and logistical functions with residential areas. This integration represents a source of economic vitality, as well as a challenge for mobility management. The Le Mose logistics hub, located in the southeastern quadrant of the city, is the main reference point and serves as one of the region's key economic drivers. In addition to large industrial sectors, smaller artisanal areas near residential

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neighborhoods, such as Infrangibile and Veggioletta, create direct interaction between economic activities and residents' daily lives.

This close proximity inevitably generates heavy traffic near residential areas, resulting in environmental and noise pollution. Careful and efficient management of the last mile is necessary to reconcile the needs of distribution and production with urban quality and the protection of residents' health and well-being.

Planning framework

The City of Piacenza has a mobility planning framework that includes various strategic and operational tools. However, some areas dedicated specifically to urban freight logistics remain underdeveloped.

The Sustainable Urban Mobility Plan (PUMS), serves as the primary strategic tool for defining urban mobility policies. Following monitoring activities conducted in 2023, the plan will be updated to adapt to new local dynamics and emerging needs.

The Urban Traffic Plan (PUT) governs the organization of urban traffic and traffic regulations. The General Urban Plan (PUG), which is currently under review, addresses the territory's evolving dynamics, including logistics and environmental sustainability. It defines strategies to improve urban quality, mitigate environmental impacts, and adapt to climate change.

However, there is no Sustainable Urban Logistics Plan (SULP). This would allow for a comprehensive approach to managing freight flows, last-mile distribution, and integrating economic, environmental, and urban needs. Similarly, an Urban Parking Plan has yet to be adopted, leaving the management of parking spaces and parking regulation policies unintegrated into a comprehensive, up-to-date strategic framework.

4.3.2 Overview of current urban freight and logistics challenges

The strong logistics focus of the Piacenza area represents a significant economic and competitive asset. However, the presence of major production and distribution hubs, combined with the growth of e-commerce and the increasing fragmentation of deliveries, creates new challenges in managing urban freight mobility.

In this context, the City of Piacenza has chosen to join the DISCO project with the aim of exploring innovative tools and strategies to improve the efficiency of urban freight distribution, while reducing its impact on the quality of public space and the environment.

The main critical issues currently observed can be summarized in the following areas.

a) Traffic congestion and interference with urban traffic

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The significant flow of heavy vehicles heading to logistics hubs puts considerable pressure on the infrastructure network, especially along ring roads and main access routes to the city. Certain urban thoroughfares are most affected by through traffic. Congestion during peak hours negatively impacts private mobility and the efficiency of local public transportation.

b) Last-mile delivery challenges in the historic centre

The growth of e-commerce and changing consumption patterns have increased home deliveries and direct shipments to retail establishments. This has resulted in a growing number of commercial vehicles entering the city centre, especially during the morning hours. Analysis conducted as part of the City Logistics project revealed an estimated 3,800 weekly deliveries in certain commercial areas, predominantly in the morning[40].
Currently, the city regulates access for freight transport operators by issuing the "ZTL Blu" pass. This pass allows entry into restricted traffic zones and free parking in spaces reserved for loading and unloading operations (for a maximum of 30 minutes with a parking disc displayed) and in general parking spaces. The permit also allows access to Urban Pedestrian Areas (APUs), where loading and unloading is permitted only for the strictly necessary time and outside of peak pedestrian traffic hours (7:30–9:00 a.m. and 12:00–2:00 p.m.). Despite these regulatory measures, high delivery demand, limited space availability in central areas, and the need to balance urban functions still lead to illegal parking and interference with pedestrian, bicycle, and vehicular traffic.

c) Environmental impacts and urban quality

The urban logistics system has effects that extend beyond traffic management, affecting environmental quality and the liveability of urban spaces. Issues such as air emissions, noise, land use, and energy impacts related to freight transport are becoming increasingly significant for local governments. Therefore, the challenge lies in identifying organizational models that can maintain the competitiveness of the local economy while reducing environmental impacts and improving public spaces.

4.3.3 Links with other projects and initiatives

The Municipality of Piacenza has already gained significant experience through projects dedicated to improving the organization of goods in urban areas. Noteworthy projects include the Merope Project and the City Logistics Project, which have helped build a knowledge and relationship base useful for analysing the DISCOCURB strategy.

[40] City Logistics" project by Laboratori aperti Emilia Romagna, Laboratorio Aperto Piacenza Ex-Chiesa del Carmine e Comune di Piacenza, with the support of Fondazione Brodolini and ITL. Link: https://www.logisticamente.it/articoli/14757/logistica-dellultimo-miglio-a-piacenza-attivo-il-progetto-city-logistics/

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The **Merope Project** (September 2002 – November 2004) was an analytical and experimental initiative focused on studying urban mobility dynamics, particularly the freight component. The project's main goal was to develop evaluation models and telematic tools for managing and controlling mobility and logistics in urban and metropolitan areas. The aim was to enable the development and application of ICT to support the creation of integrated transportation systems, thereby enhancing economic competitiveness, improving mobility, and increasing overall urban liveability.

In line with the objectives of the Emilia-Romagna Region, the project deepened the understanding of urban traffic flows and initiated a discussion on the interaction between private mobility, public transportation, and freight distribution. This strengthened the integrated approach to mobility planning. While not exclusively dedicated to curbside management, the project raised awareness of critical issues related to urban freight distribution, particularly in historic and functionally dense contexts.

The **City Logistics** project (November 2021 – September 2022) focused specifically on urban freight distribution and last-mile logistics. Through the collection and analysis of data on urban freight distribution, logistics flows, e-commerce, couriers, and commercial activities, the project provided insight into the key challenges and opportunities of the urban logistics system. Following the study phase, an international call for proposals was launched to select startups capable of proposing innovative urban logistics solutions with a focus on sustainability, e-commerce, and the last mile. A three-day City Logistics Camp was also organized to bring together startups, universities, public administrations, and local stakeholders to develop and test ideas and solutions prior to finalizing the operational plan.

The participatory process, which involved businesses, logistics operators, and stakeholders, was designed to share project decisions, gather feedback, and build consensus on the identified solutions. This project enabled the Municipality to gain a greater understanding of the needs of logistics operators and establish political legitimacy regarding innovative interventions in the sector.

In addition to the aforementioned initiatives, the Polytechnic University of Milan conducted an analysis between September 2023 and September 2025 as part of **the City of Piacenza's Urban Hub monitoring**.[41] The analysis highlighted the particular relevance of planning sustainable practices for last-mile freight distribution in this context.
Within the historic center, there are 1,517 ground-floor commercial spaces, corresponding to 2,870 storefronts, with a significant concentration of retail and service businesses located in the historic center. Specifically, there are 455 retail businesses (29.99%), 247 artisanal businesses (16.28%), 183

[41] Analysis by Comune di Piacenza - Settore Pianificazione strategica and Politecnico di Milano URB&COM Lab Urbanistica e Commercio.

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food and beverage establishments (12.06%), and 216 administrative and service businesses (14.24%), distributed primarily along the main urban thoroughfares such as Via XX Settembre, Piazza Duomo, Corso Vittorio Emanuele II, Via Sopramuro, and Via Cavour. This settlement pattern generates a high potential demand for frequent deliveries, restocking, and pickups, often concentrated in central areas with high pedestrian traffic and limited vehicle access. At the same time, the presence of 375 vacant or disused spaces (24.72%), a significant portion of which has been consolidated over time, represents a strategic opportunity for the establishment of urban logistics microhubs, freight consolidation points, or depots for low-emission vehicles. In light of these factors, Piacenza's urban system lends itself to the adoption of innovative city logistics models based on consolidated deliveries, the use of cargo bikes and e-vans, the regulation of loading/unloading time slots, and the functional reuse of underutilized spaces, with expected benefits in terms of reduced traffic, emissions, and logistics costs for businesses.

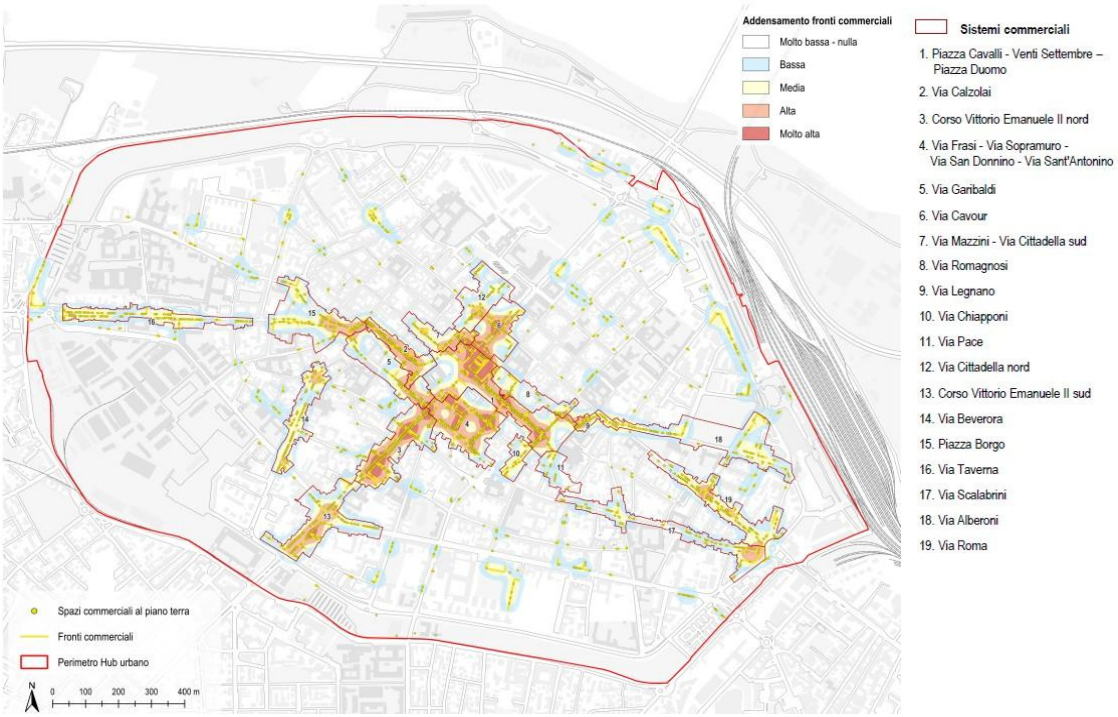


Figure 16: 5. Analysis of commercial spaces in historic center. Image produced by the Politecnico di Milano – "Periodic Monitoring of the Urban Hub's Offer (II Monitoring)"

Ultimately the Mobility and Traffic offices of the Infrastructure and Smart City Sector within the municipality developed a detailed map of parking spaces within the municipal territory for management and operational purposes. The map includes various types of parking, such as free (white zones), paid (blue zones), spaces reserved for people with disabilities, and areas designated for loading and unloading goods. The map is updated regularly in line with changes to parking regulations and traffic patterns. This provides the departments with an up-to-date overview and enables them to effectively monitor the distribution and management of parking spaces throughout

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the municipal area.
The inventory and monitoring of spaces designated for loading and unloading goods is particularly important because it is a fundamental element of urban logistics, especially so-called "last-mile logistics." Having up-to-date information on the location and characteristics of these spaces allows for an assessment of whether the supply meets the needs of businesses and delivery services. This helps improve the efficiency of distribution activities, reduce illegal parking, and minimize impacts on traffic and the quality of public spaces. Thus, mapping loading zones provides a strategic information base for planning interventions that promote more sustainable and efficient urban freight mobility management.

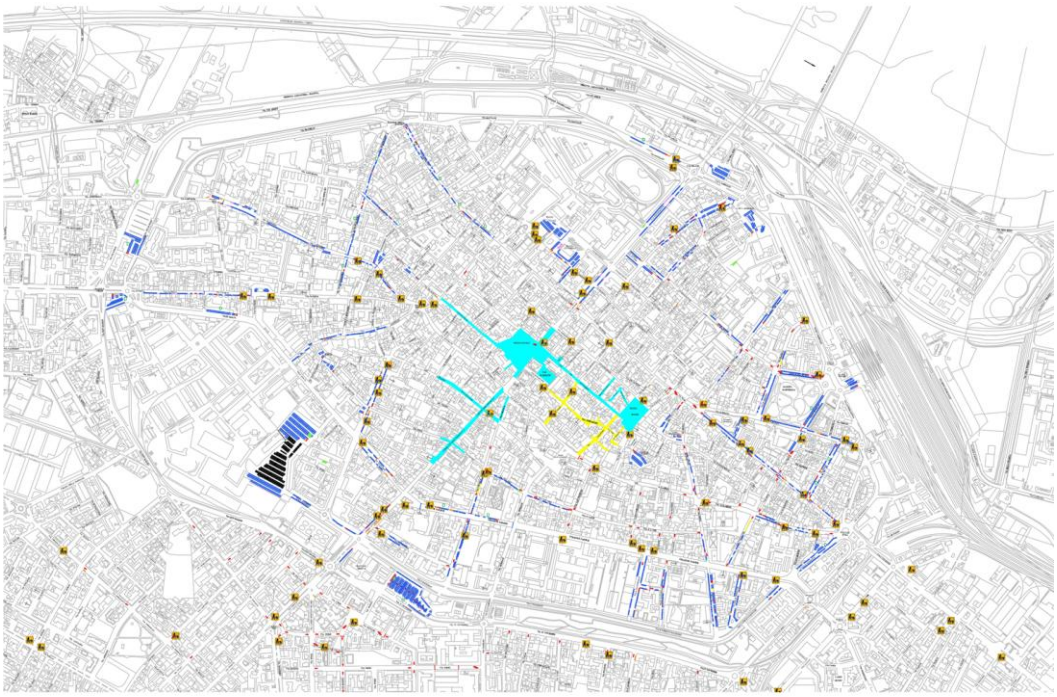


Figure 17: Parking space layout. Image produced by the Mobility Office – Infrastructure and Smart City Division

4.3.4 Main learnings from the Webinar Series and the DISCO project

Participation in the webinar series organized as part of the European DISCO project provided an opportunity to explore new approaches to sustainable urban logistics planning, based on the integration of data, land-use planning, public space management, and collaboration between public and private entities.

Among the various experiences presented by the project's pilot cities, the Municipality of Piacenza identified several areas of particular interest in relation to its territorial development strategies and existing municipal planning instruments.

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An initial solution of interest is the DISCOBAY model, which aims to rationalize interchange points between different modes of transport and improve the organization of spaces dedicated to logistics operations. This approach aligns with the long-term strategy in Piacenza's General Urban Plan (PUG), which identifies the Polo del Ferro [42]project as a strategic initiative to redevelop the railway area and station. The project could create an intermodal hub, strengthening the city's role in rail transport, urban mobility, and logistics. Although this is a medium- to long-term perspective, the example of DISCOBAY would represent a useful reference for designing and managing such infrastructure in the future.

A second area of interest, which is likely more immediately applicable to the Piacenza context, is DISCOCURB. This model proposes a new approach to curbside management. This solution's principle is viewing the street as a limited resource to be managed dynamically and multifunctionally. This is achieved by improving the regulation of short-term parking areas, loading and unloading zones, spaces for micromobility, and other urban accessibility needs. The DISCOCURB approach is particularly relevant for the city of Piacenza, where managing parking and goods distribution in the downtown area is becoming increasingly important. The methodologies presented during the webinars highlight how a better understanding of demand flows, supported by data collection and sharing among the administration, logistics operators, and other stakeholders, can enable more efficient planning of road spaces. This, in turn, can reduce congestion, illegal parking, and conflicts between different urban functions.

Another interesting point that emerged during the in-depth exploration of the DISCO project is the experience that the city of Padua developed within the DISCOCURB solution. The approach tested by the Twinning Living Lab is applicable to the Piacenza context, which has a comparable urban scale and needs to reconcile various demands on public space, such as vehicle parking, loading and unloading operations, accessibility to economic activities, and urban space quality.

To explore the possibility of transferring some of the tested solutions, two technicians from the City of Piacenza conducted a technical visit to the City of Padua on 24 November. During the visit, they held a full day of discussions with technicians from the Mobility Department. This meeting was an important opportunity to exchange knowledge and directly observe the solutions adopted in the DISCO project's Living Lab. The lab is designed to test new models for the dynamic management of road space and adjacent areas. The technicians from Piacenza observed and tested Padua's tools for monitoring, managing, and optimizing parking spaces for various urban functions. The goal is to make road space use more flexible, efficient, and responsive to actual demand.

Padua's Living Lab has piloted the transformation of certain loading and unloading zones into flexible

[42] The Polo del Ferro (or Polo Ferroviario) in Piacenza refers to two major rail-related developments in the city: a massive intermodal logistics hub in the Le Mose district and a dedicated railway maintenance center operated by the Italian Ministry of Defence.

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areas with the DISCOCURB solution. In Via Oberdan, the pilot system enables the flexible, reservation-based management of loading and unloading spaces, optimising urban logistics and the use of public spaces while facilitating the collection of data that can be used for future planning purposes. The meeting highlighted how the DISCOCURB approach could be a practical and adaptable solution for Piacenza. It would introduce a flexible model based on data analysis that can adapt public spaces to the city's changing needs throughout the day.

The Padua experience is particularly significant for the city of Piacenza because it was developed in a comparable urban context, where the challenges related to goods distribution, loading and unloading space availability, and the coexistence of different road functions are similar to those in Piacenza's historic center. This exchange has therefore provided a useful foundation for evaluating future trials in the Piacenza area, particularly regarding parking regulation policies, urban logistics, and smart public space management.



Figure 18: Photos taken during the city visit to Padua – 24 November 2025

4.3.5 Rationale of solutions chosen

Of the various solutions analyzed within the DISCO project, the DISCOCURB approach is the most applicable strategy for the city of Piacenza in the short and medium term. It allows for targeted interventions on existing urban issues without requiring the construction of new, complex infrastructure.

Piacenza faces challenges related to the urban distribution of goods, particularly in areas with a high concentration of commercial activities and services. The frequency of deliveries in these areas often leads to commercial vehicles illegally parking. Often, the lack of or insufficient availability of dedicated spaces near delivery points leads operators to improperly load and unload, temporarily

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occupying traffic lanes, pedestrian areas, sidewalks, and parking spaces intended for other users. This has repercussions for traffic flow, road safety, and the quality of public space.

Implementing the DISCOCURB model could begin with analyzing the local area to identify zones affected by goods distribution and locations where illegal parking frequently occurs during delivery operations. This analysis would enable more effective planning of loading and unloading bay locations, placing them in areas with the highest demand and establishing regulations that better align with the needs of economic operators.

After identifying the strategic bays, the system could be implemented by installing occupancy status sensors and variable-message signs to communicate space availability to logistics operators. A digital monitoring platform could collect and visualize occupancy data in real time, facilitating more efficient delivery operations and reducing the time required to find an available space. This data could also be organized into specific analytical dashboards. The municipal administration could then use these dashboards to monitor indicators such as parking space occupancy rates, vehicle turnover, average usage times, and peak demand periods. This information would support decision-making for updating parking regulations and urban logistics policies, allowing the supply of spaces to progressively adapt to the city's actual dynamics.

Adopting such a solution would allow Piacenza to introduce an innovative model for smart loading and unloading area management, transitioning from static space planning to a dynamic, data-driven system. This system would improve the efficiency of goods distribution, reduce illegal parking, and foster better coexistence among the various functions that occupy urban public space.

4.3.6 SWOT Analysis

Strength	Weakness
Data-driven management: Transition from a static parking model to a dynamic one, with precise data on flows, turnover, and occupancy.	Initial investment required for the installation of sensors, variable-message signs, and digital management platforms.
Decision-making optimization: Integration with existing mapping systems (Merope and City Logistics projects) to better plan parking spaces.	Need to establish an internal organizational model for data management, system monitoring, and updating the rules governing parking space usage.
Improved liveability: Reduction of illegal parking in the historic center to benefit pedestrians, cyclists, and traffic flow.	Need to train municipal staff to use new digital tools and correctly interpret the collected data
Efficiency for transporters: Less time wasted searching for parking, real-time navigation, and reduced risk of fines.	Potential difficulties in coordinating between different municipal departments (mobility, local police, information systems, maintenance).

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Public-Private Partnership: Shared rules based on real data and objective needs rather than arbitrary restrictions	Maintenance and technology upgrade costs in the medium to long term.
	Risk of inflexibility: Time frames that are too tight and may not accommodate unforeseen events in the logistics chain.

Opportunities	Threaths
Strategic planning: Use of data as the foundation for developing future urban plans (SULP and Parking Plan).	Perception of punitive enforcement: Risk that operators will view the system as merely a tool for surveillance and penalties.
Smart City Ecosystem: Integration of parking data with city-wide traffic and mobility monitoring systems.	Long-term financial sustainability: Maintenance costs, software updates, and sensor replacements exceed the current budget.
Regeneration and Micro-logistics: Utilizing vacant storefronts (25% in the city center) to create microhubs, promoting cargo bikes and green deliveries.	Underutilization of the system: Risk that the platform will become an “empty box” if the data is not integrated into policy decisions.
Multifunctional Evolution: Opportunity to follow Padua’s example by installing lockers and advanced pickup points at traffic intersections.	

Table 13: Piacenza's SWOT analysis

Strengths

The main strength of the potential implementation of DISCOCURB in Piacenza lies in its ability to transform the management of loading and unloading bays from a predominantly static and regulatory system into a dynamic, data-driven model.

For the municipal administration, this means having access, for the first time, to objective, continuous information on urban goods distribution flows. With the help of sensors, digital platforms, and monitoring systems, the occupancy level of the bays, average usage times, turnover rates, and peak demand time slots can be accurately determined. In a city like Piacenza, which is characterized by heavy logistical pressure and a historic center with limited space, this information would represent a significant qualitative leap forward compared to the current management system, which relies primarily on ad hoc observations and standardized regulations.

Dashboards and objective indicators would also improve the quality of administrative decisions, enabling more effective planning of parking spaces dedicated to loading and unloading operations

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in terms of location, number, and regulations. This is particularly relevant since the city already has a detailed map of parking spaces and a knowledge base developed through the Merope and City Logistics projects.

Another key strength of the measure is its ability to reduce illegal parking, which currently constitutes one of the main challenges in the historic center. Checking parking space availability in real time and directing operators to available spaces can reduce the improper occupation of traffic lanes, sidewalks, pedestrian areas, and spaces intended for other users. This improves the coexistence of urban logistics, pedestrian mobility, cycling, and vehicular traffic.

From the perspective of business operators, DISCOCURB would offer significant benefits as well. Greater certainty in finding available parking spaces in high-demand areas would reduce search time and allow for better delivery route planning. These improvements would result in more efficient deliveries, reduced downtime, and a lower risk of fines due to unauthorized parking necessitated by operational needs. The ability to access real-time information via digital apps or information panels would be equally important. Operators could plan their activities with greater precision, improving service reliability and optimizing resource utilization.

Finally, the system would foster a more collaborative relationship between the administration and logistics operators because the rules for using the spaces would be based on real data and measurable operational needs. This would partially overcome the traditional conflict between public regulatory requirements and economic necessities.

Weaknesses

The main weaknesses of the measure concern organizational, economic, and managerial aspects. For public administration, implementing DISCOCURB requires a significant initial investment to install necessary technologies, such as occupancy sensors, variable message signs, digital platforms, and data processing systems. While the initiative is less costly than constructing physical infrastructure, it still incurs substantial expenses that must be evaluated in relation to available resources.
Alongside technological investments, an appropriate internal organizational model must be established. Managing a system of this type requires new skills and operational procedures. Procedures must be defined for continuously monitoring the system, analyzing collected data, and periodically updating parking space usage rules. This requires training municipal staff and strengthening digital skills within the organization.

Another critical element is coordination among different administrative sectors. The Mobility, Local Police, Information Systems, Smart City, and Maintenance departments should work together. Without clear governance, system management may become fragmented and less effective.

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From the perspective of system users, the main weakness is the need to change long-standing operational habits. Many logistics operators are accustomed to flexible, informal work methods, so the introduction of digital tools and booking procedures may be perceived as a complex change, particularly by smaller entities.

Additionally, the requirement to use digital applications or platforms may initially hinder adaptation, particularly among operators with limited technological infrastructure. Finally, an overly rigid system for managing time slots or parking space usage times could reduce the operational flexibility necessary to address logistical contingencies and demand fluctuations.

Opportunities

The opportunities offered by DISCOCURB are particularly relevant in the context of Piacenza. First, there is the possibility of building a comprehensive information infrastructure for urban logistics. This infrastructure could provide fundamental data for developing a Sustainable Urban Logistics Plan (SULP) and an Urban Parking Plan, both of which are currently lacking.

This initiative would also allow the collected data to be integrated with other existing or developing systems as part of smart city policies. Looking ahead, the information generated by DISCOCURB could interface with systems for mobility management, traffic monitoring, parking regulation, and urban planning, creating an integrated platform for managing public space.

Another opportunity stems from the large number of commercial businesses and approximately 25% of vacant storefronts in the historic center. Combining smart parking space management with the potential development of urban logistics microhubs could foster new last-mile distribution models based on cargo consolidation, cargo bikes, and low-emission logistics.

From an economic standpoint, greater delivery efficiency could mean reduced operating costs for couriers and carriers. Shorter parking search times mean fewer miles traveled, lower fuel consumption, and increased vehicle productivity.

The experience in Padua also shows that dynamic curb management can lead to advanced, multifunctional public space use, including the integration of urban lockers, pickup points, and other innovative logistics functions. DISCOCURB offers opportunities to foster collaborative systems among the various stakeholders involved in urban space management. These systems would create an integrated ecosystem based on the sharing of data, information, and common goals. With advanced digital tools and a platform that can dynamically monitor and manage curb space usage, the local government, mobility operators, businesses, logistics service providers, and citizens can participate in more efficient, participatory governance.

Threats

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The main threats concern social and organizational acceptance of the measure. From the perspective of economic operators, there is a risk that the system will be perceived as an additional layer of administrative regulation and control. Initially, some parties may interpret the introduction of sensors, monitoring, and reservations as a limitation on their operational autonomy. Therefore, stakeholder engagement remains crucial. Without an adequate participatory process, the measure may encounter resistance and be implemented only partially.

Another threat is that the system may fail to maintain the necessary balance between regulation and flexibility over time. If usage schedules, permitted times, or methods of accessing parking spaces are too rigid, operators may encounter operational difficulties, which would reduce the measure's overall effectiveness.

On the administrative side, there is a risk that maintenance and technology upgrade costs will exceed initial projections over time. The economic sustainability of the system depends on more than just the initial investment; it also depends on the ability to ensure operational continuity, software updates, and replacement of technological components.

The risk of internal organizational fragmentation within the agency must also be considered. If the collected data is not effectively utilized in decision-making processes, or if there is a lack of stable coordination among the various offices involved, the platform could become a mere technological tool that does not produce the expected benefits in urban planning.

4.3.7 Next steps

After identifying the DISCOCURB strategy as the solution that best meets the city of Piacenza's needs, the next step is to determine priority areas for action and define how the technology will be implemented.

The first step would be to analyze the existing map of designated loading and unloading zones to identify those located in areas with the highest logistics demand and characterized by a higher frequency of deliveries. Collaboration with the relevant municipal offices, particularly the Limited Traffic Zone (ZTL) Office and the Local Police, will be essential to this effort. These offices already have data that is useful for understanding access flows and distribution dynamics, such as data from access control systems, ZTL pass issuance, and surveillance cameras.

Based on this information, an initial group of strategic parking spaces can be identified and equipped with occupancy sensors and variable-message signs to test and implement the DISCOCURB system. This system would enable more efficient management of parking spaces for loading and unloading goods and provide better information to urban logistics operators.

The next phase may involve gradually expanding the system to additional areas of the city based on the results of the initial implementation and monitoring of effectiveness indicators.

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4.4 Prague

4.4.1 Background and geographical context

Prague 6 (Municipal District of Prague 6) is situated in the north-western part of the City of Prague and is the largest municipal district in terms of area, covering approximately 41.54 km². From an administrative perspective, it holds the status of a municipal district with extended administrative powers. Its administrative area comprises Prague 6 itself together with the neighbouring municipal districts of Lysolaje, Nebušice, Přední Kopanina, and Suchdol.

The district is characterised by its diverse urban structure and mixed land use. It contains extensive residential neighbourhoods, important cultural institutions, and a major university campus located in its central area. On one side, Prague 6 borders the historic centre of the city, including Prague Castle and the Old Town. On the other, it is home to one of the country's most significant transport hubs – Václav Havel Airport Prague, the largest international airport in the Czech Republic. The principal transport corridor linking the city centre with the airport is Evropská Street, which serves as a key arterial route.



Figure 19: the location of Prague 6 within the Prague's agglomeration

Regarding to its strategic location and the presence of major transport and institutional facilities, Prague 6 experiences considerable transport demand. The principal factors contributing to this include:

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- The operation of Václav Havel Airport Prague, generating substantial passenger and freight traffic.
- Major transport and transit corridors connecting Prague with the north-western region of the Czech Republic.
- Daily commuting by students and employees to the district's large university campus.
- Densely populated residential areas requiring efficient transport services.

Urban transport in Prague is undergoing continuous development with a strong emphasis on sustainability and efficiency. The city's transport strategy[43] focuses on expanding the public transport network, improving infrastructure for pedestrians and cyclists, and gradually reducing dependence on private motor vehicles. Prague 6 forms an integral part of this system, with close integration into the Prague Integrated Transport (PID) network being essential for ensuring the efficient movement of both passengers and goods. In the field of urban logistics, priority is given to improving the efficiency of freight distribution and service provision while minimising environmental impacts such as noise and emissions.

Close cooperation with neighbouring municipal districts and key public institutions enables the effective coordination of transport and logistics policies, supports environmentally sustainable initiatives, and facilitates the development of infrastructure that enhances residents' quality of life. The primary objective is to establish an integrated and sustainable transport system that is closely connected to the wider Prague metropolitan area, thereby improving overall mobility and urban logistics. This approach ensures the efficient movement of both people and goods while promoting environmentally responsible freight transport, which is essential for the long-term economic prosperity and sustainable development of the city.

Cooperation between municipal districts can, however, present challenges due to differences in administrative procedures, priorities, and budgetary resources, which may complicate coordination and joint decision-making. Successful collaboration therefore depends on careful planning, clearly defined responsibilities, and effective communication that reflects local circumstances.
The effectiveness of these partnerships is further strengthened through formal and informal agreements that facilitate the sharing of services, infrastructure, and resources. At the same time, strategically important areas are coordinated at the city-wide level to ensure consistency across Prague.

A key priority for the future remains the modernisation and integration of Prague's transport infrastructure in line with contemporary environmental objectives. The introduction of innovative

[43] Sustainable Mobility Plan for Prague and Surrounding Area, Prague Public Transport Plan, Prague Integrated Transport Line Development in Prague, Prague Climate Plan up to 2030 and more.

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technologies and the wider adoption of zero-emission transport modes will play a vital role in supporting the sustainable development of urban mobility.

4.4.2 Overview of current urban freight and logistics challenges

The rapid growth of e-commerce, increasing expectations regarding delivery speed, and the transition towards climate-neutral cities are placing significant pressure on urban logistics systems across Europe. Local authorities are expected to improve the efficiency of last-mile logistics while simultaneously reducing traffic congestion, emissions, noise, and the occupation of valuable public space. Achieving these objectives requires much closer cooperation between local authorities, logistics operators, technology providers, and citizens than has traditionally been the case.

These challenges are particularly relevant for Prague 6, as the municipal district has been actively involved for many years in EU-funded projects such as DISCO, URBANE, GEMINI, focusing on sustainable mobility, digitalisation, and urban innovation. Participation in these initiatives has provided valuable experience that can support the future implementation of innovative mobility concepts and has highlighted the importance of integrating urban freight solutions into broader transport and environmental policies.

Building upon these activities, Prague 6 joined the DISCO project as a Follower Site in order to further explore potential practical solutions for sustainable urban logistics and to benefit from the experience of cities that have already implemented innovative approaches in this field.

Prague 6 has also focused on parcel locker systems within another European project (URBANE). This topic will be discussed in greater detail in the following chapter. The municipality has identified parcel lockers as a particularly promising area for future development and therefore considers the DISCO project an opportunity to extend this work by exploring the potential of dynamic parcel lockers and assessing their applicability within the local context.

At the outset of the project, Prague 6 identified several issues limiting the efficiency of its current urban freight system. Although parcel lockers have been widely accepted by residents, their deployment has so far been driven primarily by individual commercial operators acting independently. Consequently, lockers are frequently concentrated in the same locations, whilst other neighbourhoods remain insufficiently served. As most installations are located on privately owned land, the municipality has only limited opportunities to coordinate their distribution or optimise the use of public space. Furthermore, the absence of a coordinated multi-operator network reduces the potential environmental benefits that shared infrastructure could deliver.

Another significant challenge is the limited availability of operational data. Private logistics companies naturally regard parcel volumes, freight flows and utilisation rates as commercially sensitive information. Without access to reliable data, however, local authorities face considerable difficulties when planning new infrastructure, assessing demand, or evaluating the impacts of

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proposed measures. Data availability therefore represents one of the key prerequisites for evidence-based urban freight planning.

Prague 6 also recognises the need to reduce the number of delivery vehicles operating within densely populated residential areas. For this reason, the municipality is particularly interested in concepts such as shared parcel lockers, dynamic parcel lockers, micro-consolidation hubs, and digital tools capable of optimising delivery routes and the spatial distribution of parcel lockers.

The DISCO project enables Prague 6 to benefit from the experience of cities that have already tested innovative freight solutions under real urban conditions. In addition, this feasibility study provides an opportunity to evaluate which of these approaches could realistically be adapted to local circumstances while respecting Prague's governance structure and administrative framework.

From the very beginning, Prague 6 has recognised that technological innovation alone cannot address the challenges of urban freight and logistics. Successful implementation depends primarily on effective cooperation among a broad range of stakeholders. The Prague City Hall remains the municipality's most important institutional partner, as many transport policies, regulations concerning public space, and digital platforms are coordinated at the metropolitan level. Any future logistics solution must therefore be fully aligned with wider city strategies and implemented in close cooperation with the City of Prague.

Private logistics companies and parcel locker operators represent another key stakeholder group. It is generally recognised that operators have a strong interest in improving delivery efficiency; however, they remain cautious about sharing commercially sensitive information or participating in shared infrastructure managed by public authorities. Building mutual trust, establishing transparent governance arrangements, and demonstrating tangible benefits for all parties will therefore be essential prerequisites for long-term cooperation.

Prague 6 also intends to strengthen cooperation with research organisations, particularly the Czech Technical University in Prague (CTU), whose expertise in transport modelling, digitalisation, and smart city technologies can support data analysis, network optimisation, and the evaluation of innovative logistics concepts. Academic partners may play an important role in providing independent expertise and supporting future pilot projects.

Residents and local businesses likewise represent key stakeholders throughout the implementation process. Public acceptance will significantly influence the success of any future deployment of shared parcel lockers or micro-consolidation hubs within public spaces. Prague 6 therefore considers transparent communication and continuous dialogue with local communities to be essential. Regular evaluation of environmental and social impacts will help ensure that proposed solutions respond to local needs while preserving the quality of the urban environment and public space.

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Stakeholder engagement and the respective roles of individual actors will be examined in greater detail later in this feasibility study as part of the SWOT analysis, which will be complemented by a dedicated stakeholder analysis.

Participation in the DISCO project therefore represents a natural continuation of Prague 6's long-term commitment to sustainable urban mobility and innovation. Rather than introducing isolated technological solutions, the municipality aims to develop an integrated approach to urban logistics that combines digital innovation, stakeholder cooperation, and practical experience gained from other European cities.

4.4.3 Links with other projects and initiatives

Prague 6 has positioned itself as a municipal district that actively identifies and implements modern European trends in sustainable mobility, digitalisation, and smart urban development. Participation in international projects has enabled the district to strengthen its institutional capacities, gain practical experience through cross-border cooperation, and validate innovative approaches prior to their large-scale deployment. In this context, the DISCO project is viewed as a natural and logical continuation of these activities, establishing a comprehensive framework for the modernisation of urban logistics.

The URBANE project focused specifically on sustainable urban logistics and innovative last-mile delivery solutions. In its role as a Follower City, Prague 6 has analysed successful practices from Living Labs in Thessaloniki and Bologna, particularly regarding shared parcel lockers, micro-consolidation hubs, and digital tools for freight transport optimisation. The insights gained from URBANE constitute a fundamental knowledge base for activities within subsequent projects, particularly concerning the future assessment of dynamic parcel lockers under the DISCO project.

The GEMINI project addresses sustainable mobility through the concept of Mobility Living Labs. Within this initiative, Prague 6 has primarily focused on the "Mobility as a Service" (MaaS) concept and the integration of various transport modes into a unified digital interface. Although GEMINI focuses predominantly on passenger mobility, both projects share common objectives regarding digitalisation, data integration, and stakeholder engagement.

Within the broader framework of sustainable urban development, Prague 6 is a partner in the PROBONO project. In collaboration with the Czech Technical University in Prague, a Living Lab is being established with a focus on energy efficiency and the application of modern technologies, including digital-twin concepts. The project's emphasis on integrated planning and infrastructure sustainability provides valuable support for future innovations where energy efficiency is a critical factor.

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In addition to European funded projects, Prague 6 generally aligns its activities with the strategic objectives of the Prague City Hall and relevant national policies. It is essential that future logistics measures remain consistent with the broader strategies of the capital city.

Long-term partnerships with research institutions also play a vital role, particularly with CTU, which provides Prague 6 with professional expertise in transport planning, data analysis, and information technology. This academic collaboration is crucial for the independent evaluation of proposed concepts and the development of tools for evidence-based decision-making.

Finally, Prague 6 strives to create mutual synergies between the findings of various projects, ensuring that knowledge and best practices are integrated into a cohesive strategy for the district's future development.

Participation in these projects has brought Prague 6 not only concrete insights and practical solutions in areas such as shared parcel lockers, micro-consolidation hubs, and the integration of transport into a single digital application. Above all, it has allowed the municipal district to understand in detail how these international initiatives work in practice, how to effectively establish cooperation across Europe, and how to utilize the concept of Living Labs to test innovations directly in the urban environment. Consequently, Prague 6 has strengthened its internal capacities, learned how to work with real data, and verified the process of engaging key partners and the academic sector.

These experiences are of crucial strategic importance for the district's future. Thanks to them, Prague 6 no longer needs to remain merely in the role of a passive observer or "follower" that only adopts inspiration from international projects. On the contrary, it has gained the confidence to become an active leader itself in the coming years. It can be stated that Prague 6 will be fully prepared to design, manage, and implement its own large-scale innovation projects tailored to the needs of its residents.

4.4.4 Main learnings from the Webinar Series (and the on-site visit)

During the DISCO project, Prague 6 participated in a series of webinars and knowledge-exchange activities with the project partner cities. In addition, an on-site study visit was undertaken, which is described in a later chapter of this feasibility study. All of the approaches and pilot solutions presented were considered highly valuable from the perspective of Prague 6, providing important insights into current trends in urban logistics and sustainable mobility. The exchange of practical experience from the individual Living Labs enabled the municipality to gain a deeper understanding not only of the technological solutions themselves, but also of their implementation processes, stakeholder engagement strategies, and the challenges that had to be addressed during deployment.

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Although the individual pilot activities focus on different aspects of urban logistics, they share the common objective of validating innovative approaches under real urban conditions and facilitating their transfer to other European cities. All of the examples presented were considered inspiring for Prague 6. However, taking into account local conditions, previous experience, and the activities already undertaken through earlier European projects, the concept of Dynamic Lockers, as demonstrated within the Padua Living Lab, was identified as the most promising solution.

The selection of this solution naturally builds upon Prague 6's previous activities, particularly those undertaken within the URBANE project, where considerable attention was devoted to parcel lockers, their spatial deployment, multi-operator sharing, and their role in sustainable last-mile logistics. The DISCO project therefore represents an opportunity to further develop this work by exploring the more advanced concept of Dynamic Lockers and assessing their potential application within the conditions of Prague 6, with the possibility of future wider adoption across the City of Prague. Consequently, this feasibility study focuses primarily on the DISCOPROXY and DISCOCURB solutions, which have been identified as the most relevant and readily transferable approaches for the local context.

The DISCO project webinars addressed topics of significant interest to Prague 6. Based on these discussions, it was determined that this feasibility study will focus on the outputs of the Padua Living Lab, as its core challenges align closely with those of the district. The findings highlighted that the greatest potential for improving urban logistics efficiency remains within last-mile delivery. It was presented that over 50% of all logistical inefficiencies occur within this specific segment of the supply chain. Key identified issues include high delivery costs, limited opportunities for sharing logistics infrastructure, inefficient use of public space (particularly curb space), frequent double-parking, inadequate delivery service quality from a customer perspective, and a lack of available data for municipal authorities to effectively plan urban logistics development.

Simultaneously, significant opportunities for further development were introduced. These include the growing importance of Out-of-Home delivery, the wider adoption of data analytics and digital platforms, the emergence of new business models, and an increasing emphasis on the decarbonisation of urban transport. These trends are fully consistent with Prague 6's long-term objectives for sustainable mobility.

From the perspective of Prague 6, the most noteworthy solution presented was from the Padua Living Lab, which combines two interconnected concepts: **DISCOPROXY** and **DISCOCURB**. The DISCOPROXY concept involves a system of dynamic parcel lockers mounted on mobile electric platforms (NEXT pods). These units are loaded at a micro-hub on the edge of the city and subsequently moved to pre-identified locations based on current demand, where they serve as temporary collection points. Compared to traditional stationary lockers, this solution offers substantially higher flexibility and allows for an efficient response to fluctuating demand and spatial constraints.

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The second critical element is the DISCOCURB system, which addresses the efficient management of dedicated loading and unloading zones. In Padua, this was developed as a response to legislative restrictions concerning the permanent placement of parcel lockers in public spaces. Instead of constructing fixed infrastructure, intelligently managed zones are utilised, which logistics operators can book in advance via a web application. The reservation system is linked to variable message signs (VMS) that provide real-time information regarding the current booking of a specific parking space. All usage data from these zones is simultaneously transmitted to an Urban Freight Data Space, enabling continuous analysis and supporting evidence-based decision-making.

Initial pilot results confirm the potential of the proposed solution. However, it also became evident that the unauthorised occupation of dedicated zones by regular vehicles remains a significant obstacle. The experience from Padua confirms that digital technologies alone are insufficient; their successful operation must be complemented by appropriate traffic signage, supporting legislation, and effective enforcement by municipal authorities.

These insights are exceptionally valuable for Prague 6, as they build directly upon experiences gained from other projects in the field of parcel lockers while representing a further step towards intelligent and flexible urban logistics management. For these reasons, the DISCOPROXY and DISCOCURB solutions have been selected as the primary subjects for further evaluation within this feasibility study.

One of the key findings was the confirmation that the successful implementation of a similar solution depends on thorough analytical preparation. A comprehensive analysis of the most critical locations is essential, taking into account delivery demand, traffic intensity, the availability of public space, and the actual demand for delivery services. Based on these data, it is then possible to determine the optimal placement of the individual system components in order to maximise their overall benefits.

Within the DISCO project, the DISCOCURB system provides a solution primarily aimed at improving the organisation of loading and unloading activities in central urban areas. In Padua, several suitable pilot locations were identified in close cooperation with the municipal authorities. Their selection was based not only on transport analyses but also on compliance with local legislation, regulatory requirements, and the city's political priorities. A key objective was to develop a solution that would be acceptable in the long term both from the municipality's perspective and from that of the various stakeholder groups involved.

An important component of the solution is the introduction of Bookable Loading Zones. These consist of dedicated loading and unloading bays measuring approximately 7 × 2.5 metres, reserved exclusively for logistics operations. The spaces can be booked through an online platform for periods of up to 90 minutes, and their use is free of charge for logistics operators. Access is granted only after verification that the applicant is a registered logistics operator. This approach enables more

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efficient use of public space, reduces conflicts between different users, and simultaneously provides the municipality with valuable data on the actual utilisation of individual locations.

A significant part of the discussions also focused on the Dynamic Lockers concept, which represents one of the project's principal innovations. One of the main implementation challenges concerns identifying suitable and legally permissible locations for the temporary placement of the lockers within the public realm. The Bookable Loading Zones provide an appropriate solution by serving as temporary parking locations during parcel collection periods.

The visit further confirmed that the current generation of Dynamic Lockers is primarily intended for the delivery of small parcels. Large logistics operators are not yet fully prepared to integrate this delivery model into their existing distribution processes on a wider scale. Nevertheless, the concept has been designed as an open shared infrastructure (Shared Locker) that can be used simultaneously by multiple logistics providers, representing an important prerequisite for achieving more efficient use of urban space.

The Dynamic Lockers are mounted on fully electric modular vehicles (NEXT Pods), whose design offers considerable flexibility for future applications. Although these vehicles are intended to operate autonomously, current legislation still requires the presence of a driver during operation. Beyond last-mile logistics, these modular vehicles could in the future also be adapted for other municipal services or even for passenger transport within the wider urban mobility system. The individual modules can be coupled together or separated according to operational requirements, increasing the flexibility of the overall system and enabling it to respond efficiently to changing demand.

From the end user's perspective, the delivery process is fully digitalised. Parcel recipients receive a standard electronic notification informing them of the precise location and time at which the Dynamic Locker will be available. At present, these lockers are deployed within the previously described Bookable Loading Zones of the DISCOCURB system. The notification also includes a unique PIN code, allowing the user to unlock both the vehicle and the individual parcel compartment. The deployment locations of the Dynamic Lockers are determined on the basis of demand analyses, ensuring that the units are positioned where parcel collection demand is highest and allowing their operation to be continuously optimised.

From the perspective of Prague 6, this concept represents a highly promising solution that builds naturally upon the municipality's previous experience with parcel locker systems gained through earlier European projects. The combination of Dynamic Lockers and intelligently managed loading zones has significant potential to improve the efficiency of urban logistics, reduce traffic impacts, and optimise the use of valuable public space. Prague 6 therefore considers this concept to have considerable potential not only within its own territory but also across other municipal districts, particularly within the historic centre of Prague, where the demands placed on public space management and urban logistics are especially high. However, the successful implementation of

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such a solution would require close cooperation with the Prague City Hall, which would play a key role in coordinating the initiative, establishing the necessary regulatory framework, and facilitating its potential deployment at the metropolitan level. The involvement of the relevant stakeholders, including the role of the Prague City Hall, will therefore be examined in greater detail in the subsequent Stakeholder Analysis section of this feasibility study.

4.4.5 Rationale of solutions chosen

The selection of the above-mentioned solutions is based on Prague 6's previous experience in the fields of sustainable urban mobility and urban logistics, as well as on the knowledge gained through the DISCO project webinars and the technical on-site visit to the Padua Living Lab. As previously outlined, the municipal district has already addressed the topics of parcel lockers and last-mile logistics through the URBANE project and therefore considers the concept of Dynamic Lockers to be a natural continuation of these activities. Among all the solutions presented within the DISCO project, the Padua pilot was identified as having particularly strong potential for transfer to the local context due to its flexibility, practical applicability, and compatibility with the existing urban environment.

The selected solutions are primarily intended to improve the efficiency of last-mile logistics while simultaneously reducing its negative impacts on the urban environment. DISCOPROXY introduces a flexible system of dynamic shared parcel lockers that can be deployed according to actual demand, eliminating the need for permanently installed infrastructure and enabling more efficient use of public space. Meanwhile, DISCOCURB provides an intelligent approach to the management of loading and unloading zones through a digital reservation system, helping to reduce illegal parking, improve the organisation of urban freight operations, and optimise the use of curb space. Together, these solutions also generate valuable operational data that are essential for evidence-based planning and informed decision-making by local authorities.

From the perspective of Prague 6, these concepts have the potential to contribute not only to more sustainable freight distribution within the municipal district but also to the wider development of urban logistics across the City of Prague. Their future implementation would support the city's long-term objectives in the fields of sustainable mobility, digitalisation, and the optimisation of public space. However, any future deployment would require close cooperation with the Prague City Hall, logistics operators, and other key stakeholders to ensure the successful integration of these solutions into the wider transport and regulatory framework of the capital city.

4.4.6 SWOT Analysis + Stakeholders Analysis

The SWOT analysis demonstrates that Prague 6 possesses several key prerequisites for the potential validation of the DISCOPROXY and DISCOCURB solutions. Primary strengths include the municipal district's extensive prior experience with parcel lockers and last-mile logistics gained through earlier projects. Consequently, urban logistics is not viewed as a nascent field but rather as an established

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area for further development. A significant asset is also the practical knowledge acquired from the Padua Living Lab, where the specific operation of dynamic logistics solutions was observed in a real urban environment. These insights facilitate a deeper understanding of the operational, technical, and organisational requirements inherent in such innovations.

A further strength lies in the alignment of the proposed solutions with the objectives of sustainable mobility, emission reduction, and more efficient use of public space. This is particularly crucial as urban logistics increasingly impacts the quality of urban life, traffic congestion, and the utilisation of street-side space. Furthermore, the prospect of future support from the academic sector could enhance the analytical and evaluative components of any forthcoming pilot projects, for instance, by assisting in the identification of optimal locations, data collection, or impact assessments.

Concurrently, the analysis highlights several significant weaknesses that may complicate the implementation process. The most critical is the limited jurisdiction of the municipal district regarding city-wide regulations. Prague 6 is unable to implement all measures independently and is substantially reliant on cooperation with the Prague City Hall and other municipal institutions. This dependency may prolong the preparatory phase and increase the demands for coordination among various stakeholders.

Another weakness is the lack of comprehensive and reliable data concerning deliveries, vehicle dwell times, and parcel locker utilisation. Without such information, it is more challenging to pinpoint the most suitable locations for pilot testing or to subsequently demonstrate the actual impact of the implemented measures. The fragmented nature of the current parcel locker system, operated by various private companies, also poses a challenge as it may limit the willingness to share infrastructure or integrate into a unified system. These issues are further compounded by the limited availability of suitable public spaces and high competition for curb-side space, particularly in locations with intense traffic, high parking demand, and significant pedestrian movement. A specific technical constraint is the fact that dynamic lockers are currently best suited for smaller consignments, which may initially limit their adoption by a broader spectrum of delivery services.

In terms of opportunities, the proposed solutions offer a chance to validate dynamic and shared parcel lockers as a more flexible alternative to fixed installations. This approach could be particularly effective in areas where delivery demand fluctuates over time or where traditional infrastructure is unsuitable. A prominent opportunity is the introduction of digitally bookable loading zones for logistics operators. These can facilitate better delivery organisation, reduce illegal parking, and contribute to a more efficient use of curb-side and public space.

Furthermore, the acquisition of data for future urban logistics planning would be a vital benefit. Data regarding the use of loading zones, dynamic lockers, and delivery vehicle behaviour can provide a robust foundation for future decision-making by both the district and the city. Another compelling opportunity is the potential deployment of electric and modular vehicles, which could reduce emissions while offering a more adaptable operational model. Should these solutions prove

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successful, they have the potential to be scaled across other parts of Prague, especially in high-density delivery areas with restricted street space.

On the other hand, several threats may delay or restrict implementation. Chief among these are legislative and administrative hurdles regarding the placement of dynamic lockers and the designation of bookable zones. Successful deployment will necessitate clear legal and operational frameworks. There is also the risk that logistics operators may be reluctant to share data or join a common system, particularly if the practical or economic benefits are not immediately apparent.

A further threat is the low level of readiness amongst certain major delivery companies. Furthermore, inappropriate infrastructure placement could trigger negative public sentiment, especially if it is perceived as encroaching upon parking capacity, pedestrian areas, or the overall quality of public space. High initial capital expenditure—particularly for technical equipment, public space adjustments, digital platform implementation, or the operation of electric and modular vehicles—remains a significant barrier. Finally, implementation may be affected by political shifts or changing priorities, which could slow decision-making and future expansion.

Overall, the SWOT analysis confirms that the DISCOPROXY and DISCOCURB solutions hold considerable potential for Prague 6. However, any eventual implementation would be contingent upon meticulous preparation, the selection of appropriate sites, data availability, and, above all, close cooperation with the Prague City Hall, logistics operators, and other relevant stakeholders (see Stakeholder Analysis below).

Strengths	Weaknesses	Opportunities	Threats
Prior experience with parcel lockers and last-mile logistics through previous projects	Limited authority of the municipal district over transport regulation, parking management and the use of public space	Opportunity to validate dynamic and shared parcel lockers as a flexible alternative to fixed parcel lockers	Legislative and administrative barriers to the placement of lockers and the designation of bookable zones
Potential future support from the academic sector (Czech Technical University)	Dependency on cooperation with the Prague City Hall and other municipal institutions	Introduction of digitally bookable loading zones for logistics operators	Unwillingness of logistics operators to share data or engage in a shared system
Practical insights gained from the Padua Living Lab	Lack of comprehensive and reliable data on deliveries, vehicle	More efficient use of curb-side and public space	Limited willingness of some major delivery

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	stopping patterns and parcel locker utilisation		companies to adopt dynamic lockers
Alignment with the objectives of sustainable mobility, emission reduction and more efficient use of public space	Fragmented parcel locker network operated by individual private companies	Acquisition of data for future urban logistics planning	Risk of negative public perception due to inappropriate infrastructure placement
	Limited availability of suitable public spaces and intense competition for curb-side space	Potential to utilise electric and modular vehicles	High upfront costs
	Dynamic lockers are currently primarily suitable for smaller consignments	Potential for scaling solutions to other parts of Prague, particularly to locations with high delivery intensity	Political changes or shifting priorities potentially delaying decision-making and future implementation

Table 14: Prague's SWOT analysys

4.4.7 Stakeholders Analysis

In connection with the SWOT analysis presented above, Prague 6 considers it essential to identify and engage the key stakeholders who may significantly influence the preparation, implementation and potential future roll-out of the proposed solutions. As the potential implementation of these measures would depend not only on the technical feasibility of the individual solutions, but also on effective cooperation between the public and private sectors and on public acceptance, a concise stakeholder analysis has been prepared. Its purpose is to identify the principal stakeholders, their roles, interests and importance for the successful implementation of the proposed measures.

The Municipal District of Prague 6 is the primary stakeholder, acting as both the initiator of the concept and the coordinator of the overall process. Prague 6 is responsible for identifying the main urban logistics challenges within its territory, proposing suitable pilot measures and coordinating communication with the other stakeholders involved.

A further key stakeholder is the Prague City Hall. As it holds responsibility for transport regulation, parking policy and the management of public space, the proposed solutions could not be implemented without its

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active cooperation. The Prague City Hall will also play an essential role in assessing the potential for scaling the proposed solutions to other parts of the city.

Another important stakeholder group comprises private delivery companies and other logistics operators. These organisations would be the primary users of the proposed solutions, and their willingness to engage with the concept, adapt their operational processes and, where appropriate, share operational data will be one of the determining factors for successful implementation. Their day-to-day operational experience can also contribute to refining the proposed measures and identifying potential technical or organisational barriers.

Equally important are the end users, particularly the residents of Prague 6. Their acceptance of the proposed solutions will have a significant influence on their long-term viability. Residents are expected to benefit from better organised delivery operations, a reduction in illegal parking by delivery vehicles, more efficient use of public space and the potential reduction of traffic impacts. At the same time, concerns may arise regarding the location of new infrastructure or the potential reduction in parking capacity. It will therefore be essential to ensure transparent communication, timely information sharing and opportunities for public feedback throughout the preparation of any future pilot project.

The stakeholder analysis indicates that the successful implementation of the proposed solutions would depend on close cooperation among all of the stakeholders identified above. While Prague 6 would act as the initiator and coordinator of the process, the Prague City Hall would be an indispensable partner from both a legislative and institutional perspective. Private logistics operators would play a decisive role in determining the practical feasibility of the proposed measures, while residents, through their acceptance of the solutions, would significantly influence their long-term sustainability.

Stakeholders Analysis Matrix

Stakeholder	Power	Interest	Key role
Prague 6 Municipal District	High	High	Project initiator and coordinator; identification of pilot sites and local needs.
Prague City Hall	High	Medium–High	Regulatory and institutional authority; approval of transport and parking measures.
Private Logistics Operators	Medium–High	High	Primary users of solutions; operational testing and data sharing.
Residents (End Users)	Medium	Medium–High	Public acceptance; provision of feedback to ensure long-term sustainability.

Table 15: List of interested stakeholders

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4.4.8 Next steps (+risk and conclusion)

The feasibility study primarily serves as an analytical basis for Prague 6 to support future decision-making regarding the potential development of innovative urban logistics solutions. Based on the knowledge acquired through the DISCO project, the experience gained from the Padua Living Lab, previous European projects, and the analyses carried out as part of this study, it can be concluded that the DISCOPROXY and DISCOCURB solutions represent promising approaches that could be further assessed for their potential applicability within the conditions of Prague 6. At the same time, it is evident that any future implementation of these measures would require more detailed preparation, broader engagement of relevant stakeholders and, above all, close coordination with the Prague City Hall.

Finally, it is necessary to mention the subsequent steps, specifically in relation to the budget and potential implementation. In the future, the budget will be determined only after a detailed implementation plan has been prepared by the city hall. This plan will be based on local needs and priorities and will also take into account the relevant findings and recommendations of this feasibility study. Only on the basis of a refined scope of work, schedule, and expected outputs will it be possible to responsibly quantify and approve the budget.

At the same time, potential funding sources (including grant programs or partnerships) may be systematically considered in subsequent phases of the process, with regard to suitability, availability, and timing

In 2026, an implementation plan should be prepared and the related principles should be approved. As part of this implementation plan, it is also possible to consider the outputs of this feasibility study. At the same time, it is essential to account for risks arising from potential changes in the political leadership of the municipal district. Upon completion of the implementation plan, third parties (stakeholders) will also be invited to participate in the next steps.

It will also be appropriate to continue systematic communication with the key stakeholders identified in this study. Cooperation with the Prague City Hall will be of paramount importance, given its competences in transport regulation, parking policy, and the management of public space. Equally vital will be the involvement of logistics operators, whose practical experience and willingness to collaborate could significantly influence the design of any potential pilot project. Last but not least, it will be essential to maintain an open dialogue with residents to ensure that the proposed measures meet their needs and are perceived by the public as a contribution to the quality of the urban environment.

Alongside the opportunities themselves, it is essential to take into account the identified risks. The most significant of these is the dependency of any potential implementation on cooperation with the Prague City Hall. Similarly important risks include the insufficient standardisation of data, the

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limited willingness of private logistics companies to share data or participate in a shared system, and, last but not least, the potential for low public acceptance.

A significant external factor is also the municipal elections scheduled for the autumn of 2026. A potential change in the political leadership of the municipal district may influence future priorities, budgetary possibilities, and support for innovative projects. Given that this document is currently only a feasibility study and the potential implementation plan is yet to be prepared, it is appropriate to account for this factor from the outset and ensure that further decision-making is based on expert evidence, long-term strategic goals, and broad institutional consensus.

From the perspective of other cities or regions interested in replicating similar solutions, this study confirms that technological innovation alone is not the decisive factor for success. Equally important is a high-quality analytical foundation, knowledge of local conditions, the active engagement of key stakeholders, the availability of relevant data and, above all, close cooperation between the local government, the city, and the private sector. The experience gained within the DISCO project indicates that the validation of such solutions should proceed gradually, on a limited scale, and with continuous evaluation of the results achieved.

In conclusion, the participation of Prague 6 in the DISCO project has provided valuable insights, inspiration, and practical experience with innovative approaches to urban logistics. The output of this feasibility study is the identification of solutions which, from the perspective of Prague 6, appear promising and could be further developed and assessed in the future regarding their suitability for local conditions. The study serves as a basis for further strategic decision-making and opens the floor for continued professional discussion on the possibilities for the sustainable development of urban logistics in Prague 6.

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5. Remarks

The four feasibility studies developed by Aarhus, North Hesse, Piacenza and Prague 6 were produced independently, following the shared methodology and structure described in Chapter 3. Read together, however, they reveal a set of consistent patterns in what the Follower Sites learnt from the Webinar Series and the wider DISCO project, in what they found most relevant to their own context, and in how they intend to move forward. This chapter draws out those cross-site remarks before the concluding chapter closes the deliverable.

5.1 A shared starting point: curb space as the common local problem

Despite their different sizes, planning traditions and institutional set-ups, all four Follower Sites identified essentially the same underlying local challenge: curb space is scarce, contested and poorly documented, and this leads to illegal parking, double-parking and conflict between delivery vehicles and other users of public space. Aarhus lacks comprehensive data on how its existing loading bays are actually used; Kassel faces parking pressure and misuse of designated loading zones; Piacenza's historic centre suffers heavy morning delivery traffic and widespread illegal parking around commercial streets; and Prague 6 sees inefficient curb use and frequent double-parking linked to the growth of e-commerce and parcel delivery. This convergence, reached independently by four cities with very different starting conditions, is itself one of the clearest outcomes of the exchange: it confirms that the problem DISCOCURB was designed to address in the Starring and Twinning Living Labs is genuinely widespread across European cities of very different profiles.

5.2 What the Follower Sites learnt

Across all four studies, the learning that recurs most often is that technology is a necessary but not sufficient condition for successful replication. The Padua Living Lab, cited by North Hesse, Piacenza and Prague 6 alike, illustrates this directly: even with sensors, a booking application and variable-message signs in place, unauthorised occupation of loading and unloading zones continued to occur, confirming that governance, signage, communication and enforcement have to be designed in from the start rather than added afterwards. Aarhus draws the same conclusion from a different angle, noting that the DISCO Living Labs succeeded because they combined technology with trust-building, information-sharing and cooperation across stakeholders.

A second recurring learning concerns sequencing and scale. Rather than importing a full DISCO-X package, every site describes a preference for starting small: North Hesse frames this explicitly as using “DISCO as a modular toolbox”, testing only the elements needed for a clearly defined local use case; Aarhus, Piacenza and Prague 6 each describe an initial, geographically limited pilot to be evaluated before any wider roll-out is considered. The Copenhagen, Helsinki, Thessaloniki and Zaragoza cases were valued precisely because they showed that a first step can be modest – a battery-based sensor, a 15 m² micro-hub, a handful of monitored bays – without losing relevance for much larger cities.

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Finally, all four sites learnt that the exchange itself, more than any single technical demonstration, was what let them turn a general concept into a locally credible plan. Piacenza and, separately, North Hesse and Prague 6 all point to direct, in-person contact with Padua – either through a dedicated technical visit or the joint site visit organised by POLIS in May 2026 – as being at least as valuable as the webinar presentations in translating DISCOCURB and DISCOPROXY into terms that made sense for their own streets and institutions.

5.3 What the Follower Sites found most interesting

While DISCOCURB appears, in some form, in every one of the four feasibility studies, each site was drawn to it – or to a complementary solution – for a slightly different reason, reflecting local priorities:

- Aarhus was most engaged by the prospect of turning stakeholder-feedback-based decisions into evidence-based ones, using sensor and connected-truck data from Copenhagen and Helsinki to build a stronger foundation for its forthcoming Sustainable Urban Logistics Plan (SULP).
- North Hesse found the Padua transfer case the most directly relevant, but was equally struck by the Thessaloniki and Zaragoza experiences, which showed that screening existing off-street assets – rather than constructing new infrastructure – can be a credible and much cheaper starting point.
- Piacenza was most interested in the practical, adaptable nature of Padua's Via Oberdan pilot, seeing in it a model that could reconcile the competing demands on its historic centre's public space, alongside a longer-term ambition to link curbside data with the Polo del Ferro intermodal hub project envisaged in its General Urban Plan.
- Prague 6 found the Dynamic Lockers concept (DISCOPROXY) the most compelling, precisely because it builds on the district's own earlier work on parcel lockers under the URBANE project, and because of its potential for future replication beyond Prague 6 into the wider City of Prague.

Taken together, these preferences show that the Follower Sites did not simply select the most publicised DISCO-X innovation, but assessed each one against their own policy priorities, existing initiatives and institutional readiness – exactly the kind of locally grounded selection process that the Task 7.2 methodology was designed to support.

5.4 Where the Follower Sites will focus next

The four studies converge on a similar overall logic for the coming period: consolidate the evidence and lessons gathered through DISCO, agree the scope of a limited first step with the relevant municipal authority, run a small and closely monitored pilot, and only then consider whether and how to scale. Timelines differ according to each site's starting point – North Hesse deliberately anchors its baseline and asset-screening work to “from 2027”, Aarhus targets a 2026-2027 pilot

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phase feeding into its SULP, Piacenza expects to move from mapping to a first group of instrumented bays, and Prague 6 is waiting on a City Hall implementation plan expected in 2026 – but the underlying sequence, and the caution about scaling before validating demand, governance and cost, is shared across all four.

The table below summarises, per site, what was learnt, what stood out most, and where the focus now turns.

Follower Site	What they learnt	What stood out most	Where they focus next
Aarhus	The DISCO Twinning Methodology and the Copenhagen and Helsinki DISCOCURB pilots showed that data-driven curbside management works best when combined with governance and stakeholder engagement, not technology alone.	That better sensor and connected-truck data can turn freight planning from a stakeholder-feedback exercise into an evidence-based one, feeding directly into the forthcoming SULP.	Building a curbside-usage baseline, piloting sensor-based monitoring in selected zones (2026-2027), and integrating results into the SULP, with bookable bays and Zero Emission Zone measures as longer-term ambitions.
North Hesse (Kassel)	Padua showed that dynamic lockers only work with reliable, legally usable curb access and enforcement; Helsinki/Copenhagen showed the value of a low-threshold monitoring start; Thessaloniki/Zaragoza showed that small-scale reuse of existing space can substitute for new construction.	That DISCO should be used as a modular toolbox: start from the local problem and available space, and keep any first step small enough to test responsibilities, acceptance, data needs and cost before investing further.	From 2027, a DISCOCURB + DISCOBAY baseline and asset-screening exercise, followed by market dialogue and a small monitored or bookable pilot; DISCOPROXI/DISCOESTATE remain options only once demand and an operating model are confirmed.
Piacenza	The webinar series and, above all, a technical visit to Padua's Via Oberdan pilot showed how flexible, reservation-based curb management can adapt public space to a historic centre's changing needs throughout the day.	The direct, in-person exchange with Padua's Mobility Department technicians, whose urban scale and challenges (illegal parking, vacant storefronts, delivery conflicts) closely mirror Piacenza's own.	Using ZTL and Local Police data to identify priority loading/unloading zones, installing sensors and variable-message signs, and building analytical dashboards to feed a future SULP and Urban Parking Plan, before gradually scaling the system.
Prague 6	The Padua Living Lab and on-site visit confirmed that Dynamic Lockers and bookable loading zones	The Dynamic Lockers concept (DISCOPROXY), as a natural continuation of Prague 6's earlier URBANE	Preparing a 2026 implementation plan with Prague City Hall, sequencing budget and funding decisions after that plan, and

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	need signage, legislation and enforcement alongside the technology, since unauthorised occupation of zones remained a challenge even in Padua.	work on parcel lockers, and its potential for wider replication across other districts and the historic centre.	sustaining engagement with City Hall, operators and residents, while monitoring the risk posed by the autumn 2026 municipal elections.

Figure 20: Recap of most relevant aspects emerged from Followers Sites

A further shared intention is worth noting: none of the four sites frames its next steps as a stand-alone project. Aarhus plans to fold its findings into the forthcoming SULP; North Hesse ties its adoption pathway explicitly to measures already defined in the Kassel City Logistics Concept; Piacenza intends its DISCOCURB data infrastructure to feed a future SULP and Urban Parking Plan that the city currently lacks; and Prague 6 expects its findings to inform a 2026 implementation plan prepared by Prague City Hall. In every case, the ambition is to embed the DISCO lessons within an existing or emerging strategic planning instrument, rather than to keep them as an isolated pilot outcome.

Common risks are also framed in comparable terms across the four studies: reluctance of private logistics operators to share data, delays in procurement, technology deployment or regulatory approvals, funding uncertainty, and the risk that weak enforcement undermines pilot results. Prague 6 additionally highlights a risk specific to its governance context – the autumn 2026 municipal elections and the possible change in political priorities that could follow – a reminder that the strength of a feasibility case does not remove ordinary political and institutional risk from its implementation.

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6. Conclusions

Task 7.2 set out to drive capacity building and knowledge transfer across four DISCO Follower Sites – Aarhus, Piacenza, Prague 6 and North Hesse – by showcasing DISCO-X innovations through a dedicated webinar series, regular coordination meetings and, in several cases, direct site visits. On the evidence gathered in this replication booklet, that objective has been met: each Follower Site has moved from a general awareness of the Starring and Twinning Living Labs' work to a locally grounded feasibility study that identifies a specific problem, a specific DISCO-X solution or combination of solutions, and a specific, phased pathway towards a first pilot.

6.1 A converging answer on where to start

The single clearest conclusion to emerge from comparing the four studies is that DISCOCURB – data-driven, dynamic curbside management – is the DISCO-X innovation that all four Follower Sites judge to be the most transferable and lowest-risk starting point, regardless of whether it is deployed on its own, as in Aarhus and Piacenza, or paired with a complementary solution, as in North Hesse (DISCOCURB with DISCOBAY) and Prague 6 (DISCOCURB with DISCOPROXY). This is a notable convergence given how different the four cities are in size, institutional structure and planning maturity, and it suggests that curbside management addresses a genuinely common pressure point in European urban freight rather than a problem specific to any one context.

By contrast, solutions that require new physical infrastructure or a committed operating partner – dynamic lockers, proximity micro-hubs, or the reuse of existing buildings – are consistently treated as second-stage or conditional options. North Hesse is explicit that DISCOPROXI and DISCOESTATE should follow “only where demand, site feasibility and an operating model are confirmed”; Prague 6, while placing Dynamic Lockers at the centre of its feasibility study, still frames their deployment as needing close coordination with Prague City Hall before any wider roll-out. No Follower Site is proposing to adopt a locker, micro-hub or estate-reuse solution as an immediate, stand-alone measure.

6.2 Technology transfer works best as a governance and knowledge transfer

A second conclusion, reinforced by every one of the four studies, is that the value of the DISCO exchange lay less in any single technology demonstration and more in the transfer of implementation know-how: how to sequence a pilot, how to engage operators and other stakeholders, how to combine signage and enforcement with digital tools, and how to avoid over-specifying a solution before local demand and space have been confirmed. The recurring reference, across three of the four sites, to the same transfer case – Padua – and to the value of seeing it in person, underlines that peer-to-peer, city-to-city exchange remains the most effective vehicle for this kind of learning, more so than the webinar format alone.

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6.3 A shared, cautious pathway to implementation

The four feasibility studies also converge on how to move from study to practice: confirm the local evidence base, agree a small and clearly bounded pilot with the responsible authority, test it with real operators and users, evaluate before scaling, and treat governance, permissions and enforcement as being as important as the underlying technology. Each site sets this pathway against a different institutional anchor – a forthcoming SULP in Aarhus, an existing City Logistics Concept in Kassel, a future SULP and Urban Parking Plan in Piacenza, and a City Hall implementation plan in Prague 6 – but in each case, the intention is to fold the DISCO lessons into a durable planning instrument rather than to let them remain a one-off pilot outcome. This is arguably the most important sign that the replication exercise has succeeded: knowledge generated through DISCO is being institutionalised, not merely documented.

6.4 Outlook

Taken together, the Aarhus, North Hesse, Piacenza and Prague 6 experiences show that DISCO-X innovations, and DISCOCURB in particular, can be meaningfully replicated well beyond the original Starring and Twinning Living Labs, provided that Follower Sites are given the space to adapt scope, sequencing and scale to their own local conditions rather than being asked to adopt a fixed package. As these four cities move from feasibility study into pilot preparation over 2026 and 2027, their experience – and the risks and enabling conditions they have each identified – will offer further evidence for the wider European urban logistics community on how to translate Living Lab innovation into lasting local practice.

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Annex A. Evidence from the DISCO Meta Model Suite

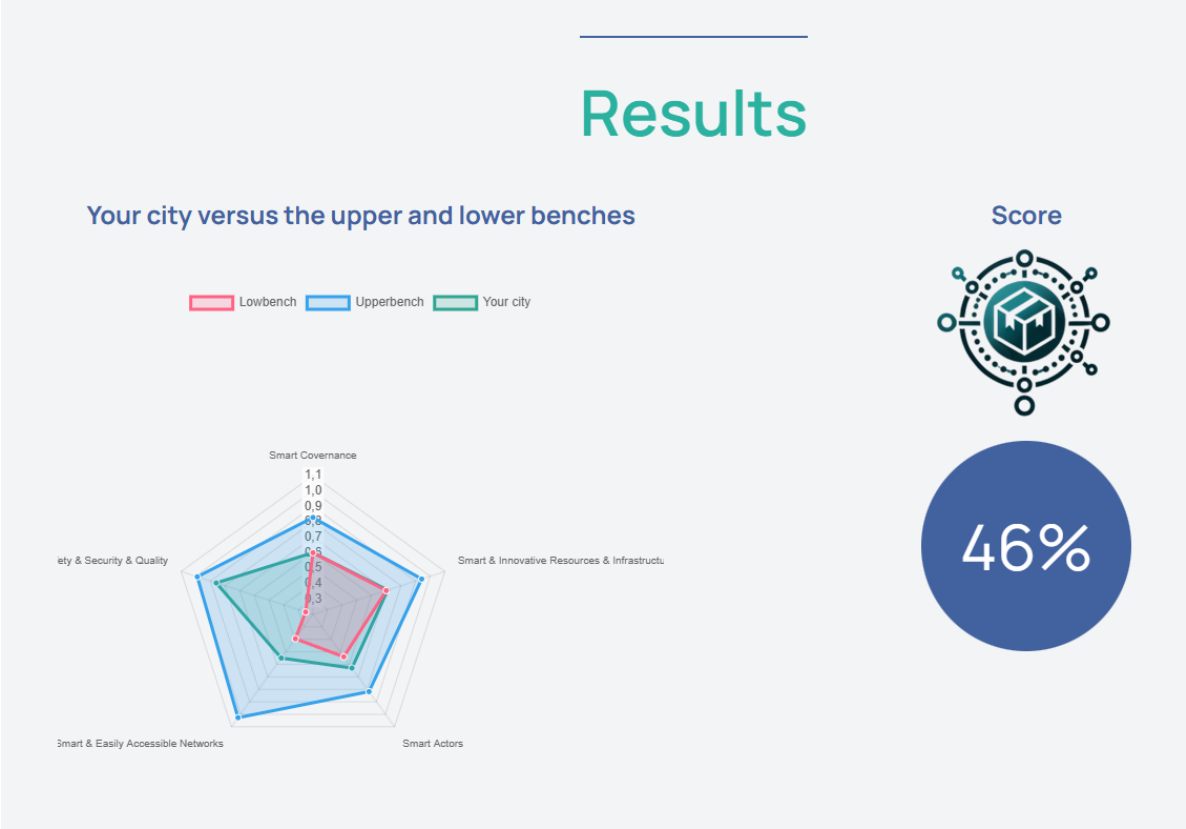
The four Follower Sites filled out CERTH's survey within the DISCO Meta Model Suite to check their readiness regarding the DISCO-X innovations.

The Digital Transition Assessment Tool is a resource designed to help organizations evaluate their readiness and progress in transitioning to digital technologies and processes. It typically consists of a series of questions, metrics, and frameworks that allow businesses to assess their current digital maturity level, identify areas for improvement, and develop a roadmap for digital transformation.

https://metamodelsuite.imet.gr/meta-model-suite

Below a few screenshots that summarise some of the most relevant elements emerged.

Aarhus



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02

Recommendations / deployment priorities

The most important actions before deployment and scaling.

1

Tools Capacity · Mixed

Procure and connect the missing operational tools

Establish tools for property-space matching, occupancy tracking, timeslot management, micro-hub network design, route optimization, dispatching, and access control. Treat these as enablement gaps before moving blocked functions into live operation.

Applies to: DISCOESTATE, DISCOPROXI

2

Data Capacity · Mixed

Build the shared data base for spaces and local delivery

Collect and standardize occupancy, safety, usage scheduling, product, micro-hub, fleet, demand, zoning, and urban logistics operations data. Use common labels and exchange rules so operators and city teams can work from the same information.

Applies to: DISCOESTATE, DISCOPROXI

3

Infrastructure Capacity · Mixed

Secure usable sites, access systems, and delivery assets

Validate underused buildings, micro-hub locations, lockers, loading equipment, network connectivity, access control, and charging or support infrastructure. Confirm that each site can safely support temporary storage, consolidation, and local distribution.

Applies to: DISCOESTATE, DISCOPROXI

4

Regulatory & Policy Capacity · Mixed

Create fast permits and operating rules

Set rules for temporary building repurposing, safety compliance, zoning permits, micro-hub activation, low-emission delivery modes, and simplified approvals. Align these rules with the dynamic curb controls already ready for use.

Applies to: DISCOCURB, DISCOESTATE, DISCOPROXI

5

Stakeholder & Business Capacity · Mixed

Confirm partners, responsibilities, and viable cost models

Secure commitments from city authorities, property owners, retailers, carriers, logistics providers, parking operators, and technology suppliers. Define who pays, who operates, who shares data, and who is accountable for service continuity.

Applies to: DISCOCURB, DISCOESTATE, DISCOPROXI

6

Cross-cutting · Optimization

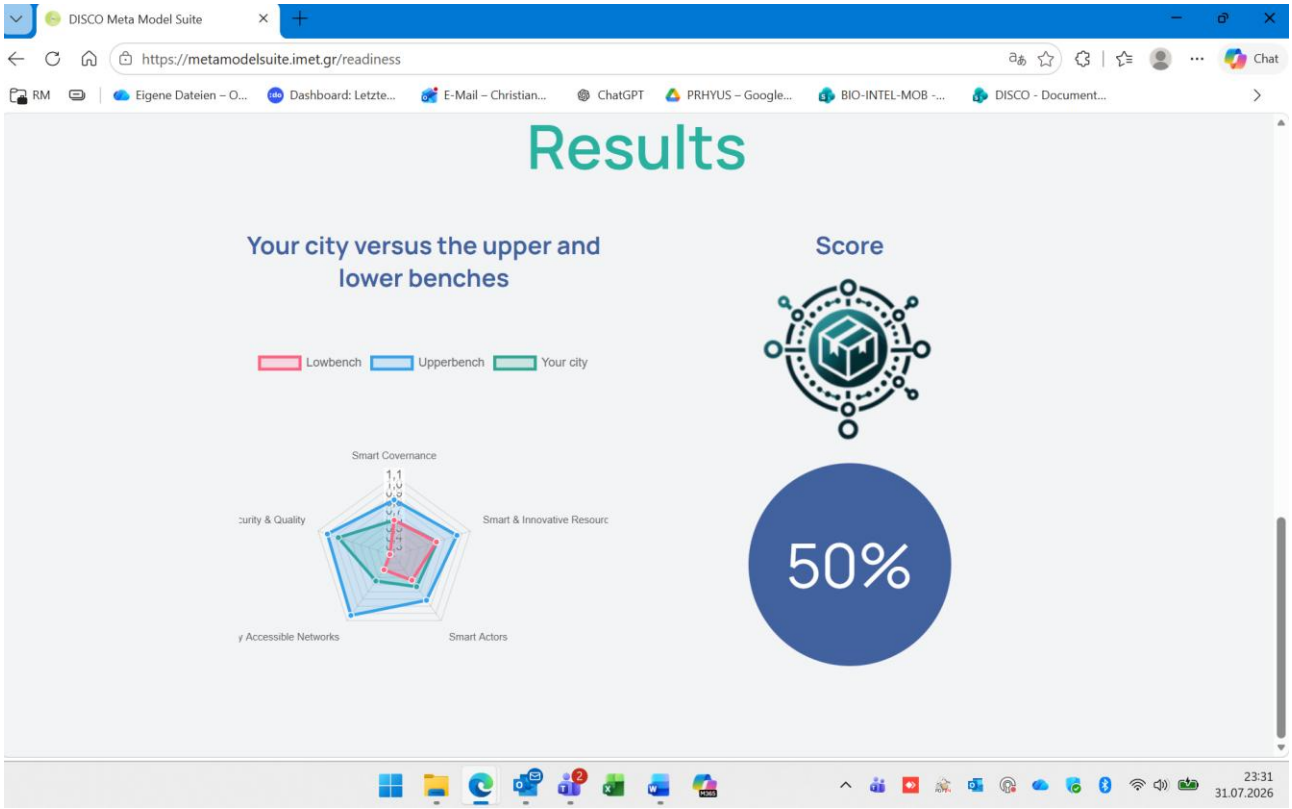
Use the curbside capability as the first controlled operational layer

Start with controlled DISCOCURB deployment, monitor booking, occupancy, misuse, compliance, and loading performance, and use the evidence to prepare the space and proximity logistics layers. Keep blocked elements in enablement until their gaps are closed.

Applies to: DISCOCURB, DISCOESTATE, DISCOPROXI

North Hesse

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02

Recommendations / deployment priorities

The most important actions before deployment and scaling.

Tools Capacity | Mixed | 1

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Establish tools for property-space matching, occupancy tracking, timeslot management, micro-hub network design, route optimization, dispatching, and access control. Treat these as enablement gaps before moving blocked functions into live operation.

Applies to: DISCOESTATE, DISCOPROXI

Data Capacity | Mixed | 2

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Collect and standardize occupancy, safety, usage scheduling, product, micro-hub, fleet, demand, zoning, and urban logistics operations data. Use common labels and exchange rules so operators and city teams can work from the same information.

Applies to: DISCOESTATE, DISCOPROXI

Infrastructure Capacity | Mixed | 3

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Validate underused buildings, micro-hub locations, lockers, loading equipment, network connectivity, access control, and charging or support infrastructure. Confirm that each site can safely support temporary storage, consolidation, and local distribution.

Applies to: DISCOESTATE, DISCOPROXI

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Regulatory & Policy Capacity | Mixed | 4

Create fast permits and operating rules

Set rules for temporary building repurposing, safety compliance, zoning permits, micro-hub activation, low-emission delivery modes, and simplified approvals. Align these rules with the dynamic curb controls already ready for use.

Applies to: DISCOCURB, DISCOESTATE, DISCOPROXI

Stakeholder & Business Capacity | Mixed | 5

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Applies to: DISCOCURB, DISCOESTATE, DISCOPROXI

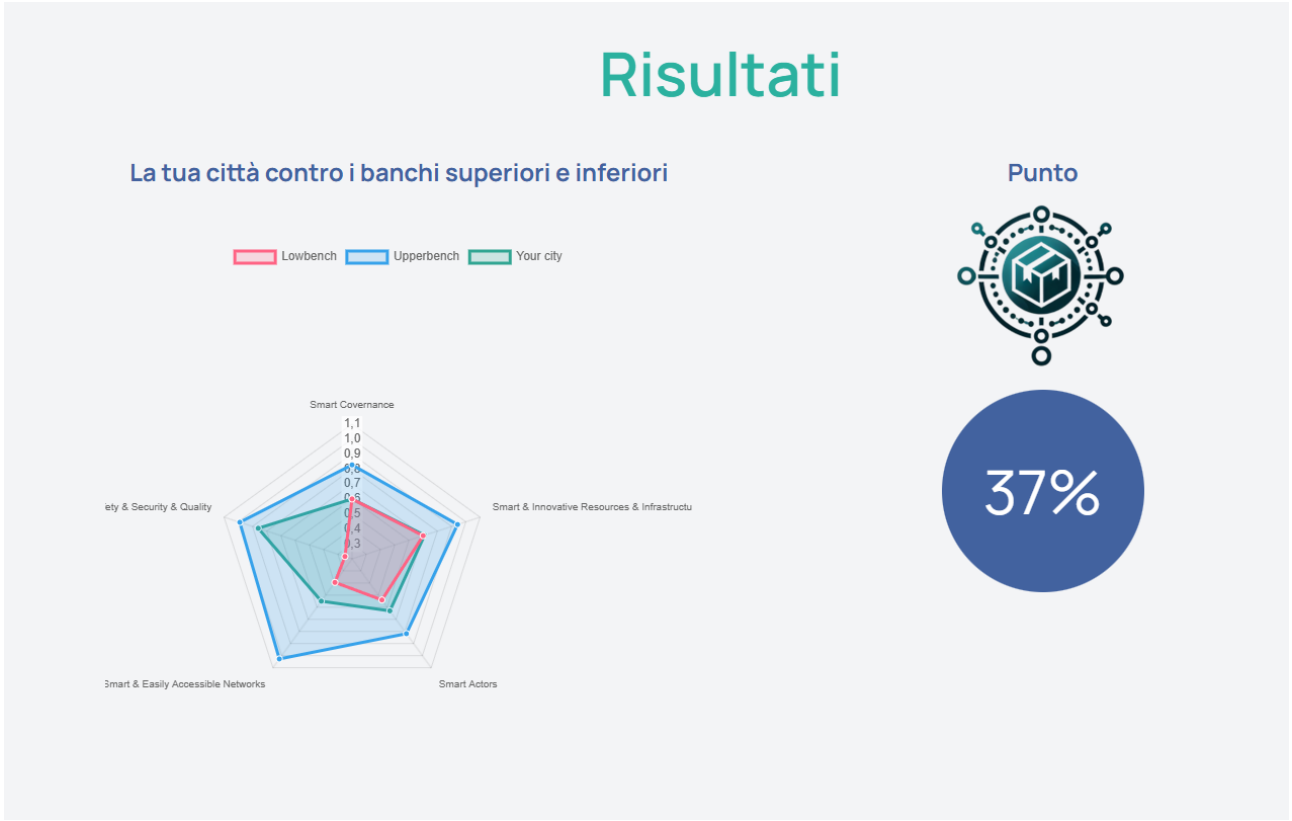
Cross-cutting | Optimization | 6

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Applies to: DISCOCURB, DISCOESTATE, DISCOPROXI

Piacenza



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Recommendations / deployment priorities

The most important actions before deployment and scaling.

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Applies to: DISCOESTATE, DISCOPROXI

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Cross-cutting · Optimization

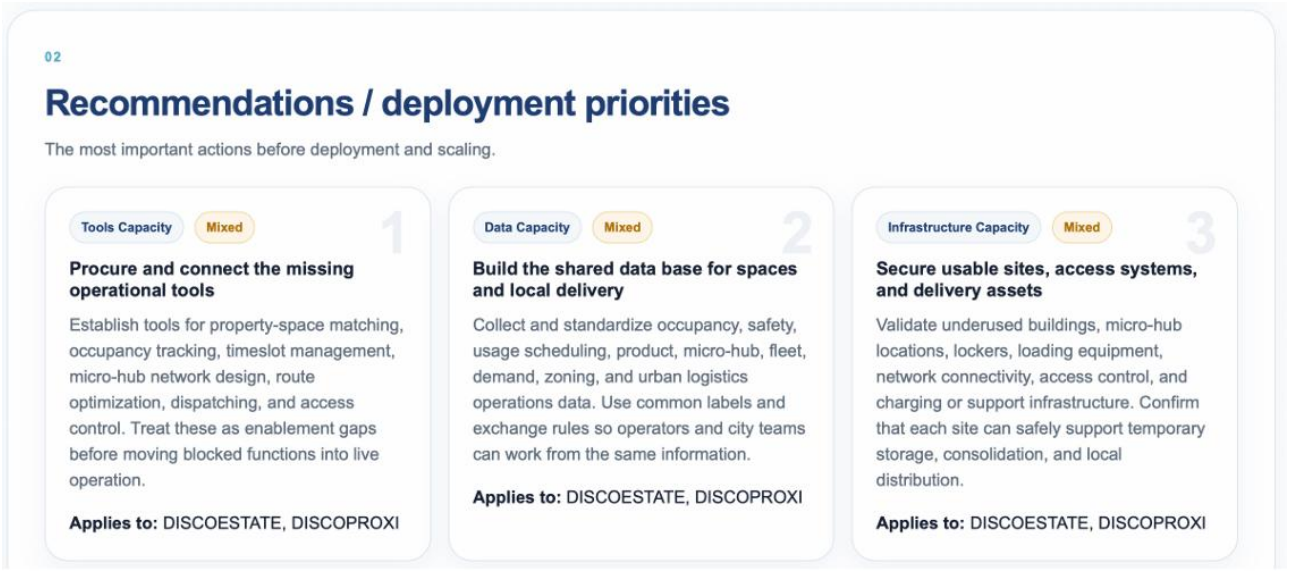
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Prague



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