GreenTurn

Prototypes and MVPs co-created

Deliverable D3.3

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Change Log

Version	Description of change
V0.1	Initial version preparation
V0.2	Version sent for review
V1.0	Final version

List of abbreviations

Abbreviation or term	Description
API	Application Programming Interface
B2B	Business to business
B2C	Business to consumer
CA	Consortium Agreement
C2C	Consumer to consumer
CO2	Carbon dioxide
CSV	Comma separated values
D	Deliverable
DOA	Description of Action
EC	European Commission
EU	European Union
GA	Grant Agreement
GDPR	General Data Protection Regulation
GHG	Greenhouse gas
ICE	Internal combustion engine
IT	Information technology
LEZ	Low emission zone
LSP	Logistics service provider
MS	Milestone
MVP	Minimum Viable Product
P and S	Pick and Smile
PC	Project Coordinator

Abbreviation or term	Description
PO	Project Officer
PSC	Project Steering Committee
PUDO	Pick up and drop off
QR	Quick response code
RFID	Radio frequency identification
SAB	Stakeholders Advisory Board
SMIL	Pick and Smile digital platform
SMIL@IA	Pick and Smile analytics and prediction module
SOP	Standard operating procedure
SULP	Sustainable Urban Logistics Plan
SUMP	Sustainable Urban Mobility Plan
TMS	Transport management system
VKT	Vehicle kilometres travelled
WP	Work Package
WPL	Work Package Leader
ZE	Zero emission
ZBE	Low emission zone term used in Zaragoza
ZFE	Low emission zone term used in Lyon
ZPA	Emergency air protection zone measures
ZTL	Limited traffic zone

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Executive Summary

Digital platforms and e-commerce services have increased the volume and the frequency of deliveries and returns in cities. As a result, urban areas face higher emissions, traffic congestion, and growing pressure on public space. GreenTurn responds to this context as a Horizon Europe project under the CIVITAS initiative, bringing together e commerce operators and public organizations to co-create and test zero-emission logistics solutions, while improving the transparency of information on environmental footprints and supporting more sustainable delivery and return options. The project applies a design thinking approach that combines behavior change techniques (incentives, nudges, and gamification) with delivery and return solutions (delivery time slots, collection services, and recyclable packaging), and tests them through five pilot programs in Austria, France, Greece, Poland, and Spain.

Against this background, the objective and purpose of Deliverable D3.3 is to support the results from Task 3.2, which converted the top ideas from ideation into specific GreenTurn solutions through agile prototyping and continuous improvement. The deliverable presents the prototypes and the Minimum Viable Products that have reached a stage where they can start pilot testing activities in a standardized format across pilot cities. It also clarifies which pilots will use specific configurations, explains the selection process, and describes the planned monitoring, testing, and validation approach for the upcoming project phases.

The main results of the deliverable show how partnerships have turned the concepts of co-creation from ideas into pilot business proposals ready for implementation. This project is implementing five pilot scenarios that cover different types of flows:

- Athens: focusing on distribution between businesses using electric vehicles with the support of a last-mile orchestration platform for routing and time slot coordination
- Zaragoza: concentrates on deliveries and returns between businesses and consumers through user-oriented integration mechanisms
- Vienna: combines circular packaging processes with a low-emission mode of transport for the last mile
- Lyon: links reusable packaging with zero-emission distribution in parcel flows between consumers and food-related activities.

Looking ahead, the deliverable frames the next steps as a move from design and refinement to structured implementation and evaluation across the five pilots. First, the consortium will apply a common pilot requirements framework that defines test environments, roles, timelines, and monitoring routines so pilots run in a comparable way while still reflecting local constraints (Task 4.1). Next, partners will operationalize the selected solutions in physical pilots and iterate through testing loops, using real

operational feedback to adjust implementation details and improve feasibility (Task 4.2). In parallel, the project will develop demand and transport models for digital testing to explore scenarios that field trials cannot cover fully, then consolidate learning across pilots and translate validated evidence into practical uptake pathways, including scale up and implementation plans, guidance for retailers, capacity building for local authorities, and policy recommendations that support replication and longer term adoption.

1. Introduction

GreenTurn is a Horizon Europe project under the CIVITAS initiative that addresses the growing impact of e-commerce deliveries and returns on cities, including emissions, traffic congestion, and pressure on public space. It brings together e-commerce operators and public organizations to co-create and test zero-emission logistics solutions, while improving the transparency of information on environmental footprints and supporting more sustainable delivery and return options. GreenTurn's design thinking approach combines behavior change techniques (incentives, nudges, and gamification) with delivery and return solutions (delivery time slots, collection services, and recyclable packaging), which are being tested through five pilot programs in various European countries such as Austria, France, Greece, Poland, and Spain.

Therefore, this project supports the EU's mobility and climate goals by improving urban freight transport through clean smart systems and by developing modern physical and digital infrastructure, including urban hubs, parcel drop boxes, and digital platforms that help operators and retailers plan and share sustainable logistics solutions. This project establishes zero-emission delivery and return operations in all pilot locations, while developing emissions measurement and reporting systems to support policymakers and decision-makers in developing sustainable urban mobility plans and sustainable urban logistics plans.

The objective and the purpose of Deliverable D3.3 is to support the results from Task 3.2 which converted the top ideas from ideation into specific GreenTurn solutions through a process of agile prototyping and continuous improvement. The solutions emerge from stakeholder collaboration to create behavioral change programs that offer delivery and return services that fulfill urban mobility targets and support SUMP and SULP initiatives in local areas. The main objective of this deliverable involves presenting the prototypes and the Minimum Viable Products (MVPs) which have reached a stage where they can start pilot testing activities in a standardized format across different pilot cities. D3.3 describes which pilots will use specific configurations and explains their selection process and details about their monitoring and validation procedures for upcoming project phases.

D3.3 builds on the ideas and concepts produced through the co-creation sessions and reported in D3.4 to structure the selection logic and the planned monitoring of the prototypes and MVPs. In terms of scope, D3.3 defines the prototype and MVP requirements for each pilot, including scenario logic, operational design choices, planned implementation steps, alignment with SUMPs and SULPs, and the approach for testing and stakeholder feedback.

Pilot overview

GreenTurn has five pilot programs covering different combinations such as business-to-business flows, business-to-consumer flows, consumer-to-consumer flows, and government-supported programs that connect local businesses with consumers. This deliverable presents the prototypes and Minimum Viable Products (MVPs) that each pilot will test, by using a common methodology while tailoring the operational details to local conditions.

Athens pilot, ElectroSmart

ElectroSmart in Athens, Greece, focuses on business-to-business deliveries and returns for electronics and small equipment consumables. LOGIKA, as a logistics service provider and KYOCERA, as a supplier, are testing how a small electric fleet can serve dense urban routes while maintaining service reliability. The pilot uses Citroen Ami Cargo electric vehicles and a last-mile orchestration platform that supports dynamic routing, time window management and real-time route monitoring. The Aegean University team is evaluating alternative scenarios, from conventional internal combustion engine trucks to electric trucks with last-mile orchestration platform, to quantify the added value of electrification and digital optimization. At the operational level, this pilot emphasizes consolidation of shipments between customers by implementing time slots to reduce repeat visits. It also addresses returns as part of the same workflow so that the operator can schedule pickups along with deliveries when feasible. Finally, it will track environmental indicators, such as energy use and avoided exhaust emission, and operational indicators, such as vehicle mileage, on-time delivery and productivity.

Zaragoza pilot, Green Button

The Green Button pilot in Zaragoza, Spain, follows a government-backed model that links the municipality, local retailers, logistics operators and consumers. The pilot operates within Zaragoza's low-emission zone and uses the central market as a focal point for urban distribution with their key intervention being a digital platform for ordering and choosing greener delivery and return options. The platform supports deliveries from multi-destination orders based on sector and consolidation rules, allowing operators to plan routes with higher load factors and fewer kilometers. The pilot combines environmental objectives with social inclusion, by working with social enterprises on selected delivery activities and using incentives to increase uptake. This pilot will evaluate the trade-offs between distance savings, delivery times, operating costs and user acceptance as well as link the results of the pilot to the monitoring needs of the municipality through dashboards and performance reports.

Vienna pilot, LogPoint

LogPoint in Vienna, Austria, is run by an inter-company fulfilment provider that operates a logistics hub in the city and serves mainly business-to-consumer shipments, with a smaller share of business-to-business. The pilot aims to improve sustainability through two linked changes. First, it introduces circular packaging practices at the fulfillment hub by collecting used cartons, shredding them on site and reusing the material as a filler. Second, it transfers eligible urban deliveries from the national parcel network to a local partner that delivers by e-scooter. This combined configuration shortens the transportation chain, reduces handling steps and creates measurable reductions in packaging waste and transportation emissions. To make the approach workable, the pilot defines new internal procedures for the collection, storage and shredding of cartons and sets rules for the distribution of parcels in e-scooter delivery. Finally, it will monitor both material flow indicators, such as packaging reuse and avoided filler purchases, and logistics indicators, such as delivery performance within time windows and operating costs.

Lyon pilot, SustainSwap

SustainSwap in Lyon, France, is evaluating a multi-flow pilot program linking consumer-to-consumer re-trade shipments with business-to-consumer grocery distribution. Pick and Smile operates high-volume pickup and delivery points and is working with Vinted Go and Intermarché to test circular and zero-emission options. The pilot includes three components:

1. It introduces reusable packaging for Vinted Go shipments and tests behavioural prompts that encourage users to return and reuse packaging.
2. It tests zero-emission replenishment of pickup points for Intermarché using e-cargo bikes, reducing truck activity in dense neighbourhoods.
3. It pilots zero-emission home delivery of Intermarché grocery orders using the same fleet of cargo bikes.

By combining packaging circularity with the active distribution of transport modes, this pilot can measure the impact on material use, vehicle movements and customer experience in an urban environment. The pilot will capture reuse cycles, return rates, trip characteristics, delivery-time performance and operational stability. It will also take into account local policy drivers, including low emission regulations, to ensure that the tested configuration remains compatible with future constraints.

Poznan pilot, GreenRoute

The Poznan pilot program (GreenRoute) in Poland is being implemented as a digital, model-based intervention developed in the form of an urban logistics simulation model, complementing the pilot program in Lyon, where the Pick and Smile concept is being tested in real conditions, analyzing how the same concept and related integration approaches could be adapted to the Polish logistics market. It reproduces last-mile parcel flows in the central urban area of Poznan, including both deliveries and returns, and tests alternative configurations before making any real-world investment decisions. In particular, it evaluates how the integration of micro-hubs and PUDOs, the use of cargo bikes and the recycling of packaging can affect operational performance, costs and environmental outcomes. Further, the pilot program models customer response to eco-friendly delivery options and links behavioral acceptance to operational consequences so that the analysis reflects both system design and user acceptance. Finally, this pilot project is coordinated by Łukasiewicz, Poznański Instytut Technologiczny (LPIT) with the support of Pick and Smile and the Municipality of Poznań, using anonymous operational data, geographic data sets, policy parameters, and vehicle cost and emission factors.

The deliverable structure shows this focus through three main sections. **Chapter 3** outlines the common methodology applied across pilot projects, covering the pilot context, the scenario development and evaluation process, the steps used to design each MVP, the alignment with sustainable urban mobility plans and sustainable urban logistics plans, as well as the approach used for testing and feedback. With this basis, **Chapter 4** reports on the specific prototypes and MVPs of the pilots using a consistent structure. For each pilot, it describes the baseline situation, the alternative scenarios considered, the selected configuration, the operational requirements, the implementation steps and the testing approach as well as the main mitigation measures to be taken. **Chapter 5** then consolidates the findings of all the pilots, offering a comparison that highlights common success factors, key constraints and practical considerations for transfer to other contexts. Finally, **Chapter 6** summarizes the main findings and provides a perspective on the next steps for pilot implementation and evaluation.

2. Methodology

This chapter outlines the methodology as part of the broader framework of Work Package 3, whose objective is to transform stakeholder co-creation outcomes into tangible and testable solutions for sustainable e-commerce logistics.

The objectives of WP3 are:

- Development, together with stakeholders, of ideas and concepts for more sustainable delivery and return options.
- Prototyping of these concepts into Minimum Viable Products (MVPs) through agile co-creation with stakeholders.
- Identification of novel and sustainable business models and logistics operations in e-commerce deliveries and returns.

Within this framework, Task 3.2 requires converting chosen concepts and scenarios from Task 3.1 into functional prototypes and MVPs for pilot city deployment. The co-creation process begins in Task 3.1 when the project teams works with logistics service providers, retailers, consumers and local authorities to generate innovative ideas through brainwriting and mind-mapping and story-boarding techniques. During evaluation, stakeholders rate the proposed concepts using sustainability and feasibility criteria defined in the project's evaluation framework.

Building on these results, Task 3.2 applies a specific methodology to design, test, and refine the selected pilot solutions where the task begins by analyzing the alternative scenarios identified in the ideation phase, followed by the selection of the best pilot configuration using predefined evaluation criteria. Thus, in order to identify the MVPs, the following steps were implemented:

Step 1: Pilot Framework and Use Case Definition

Step 2: Development and Evaluation of Alternative Scenarios

Step 3: MVP Design and Operational Planning

Step 4: Alignment with Urban Mobility Plans (SUMP/SULP)

Step 5: Testing, Validation and Feedback Integration

The above-mentioned steps of this methodology are described in detail in the subsequent subsections.

2.1 Pilot Framework and Use Case Definition

The GreenTurn project provides a systematic approach to launch and execute pilot urban logistics projects in participating cities. The pilot framework enables each local implementation to base its approach on specific needs and regulatory conditions and operational realities of its context while maintaining alignment with project-wide objectives.

Co-Design and Stakeholder Engagement

The beginning of each pilot requires active participation from all relevant stakeholders. The process requires participation from logistics operators and municipal authorities as well as business clients and technology partners and end-users when appropriate. Stakeholders work together through workshops and interviews and joint planning meetings to establish the pilot's scope and ambition. The co-design process guarantees that the resulting use case solves real urban mobility problems and supports strategic goals of public and private partners.

Local Context and Problem Identification

The analysis of the urban environment focuses on logistics demand and delivery practices and infrastructure availability and regulatory restrictions and market trends. The analysis reveals particular operational bottlenecks which include delivery congestion and emissions hotspots and last-mile inefficiencies. The process incorporates information about low-emission zones and delivery access rules and customer service expectations which influence pilot design.

Definition of the Pilot Use Case

The pilot use case receives its formal definition through the analysis of stakeholder engagement and local context information. The use case outlines the fundamental logistics issue to solve together with the selected business model (B2B, B2C or reverse logistics) and essential operational and technological and environmental targets for the pilot program. The definition outlines the primary actors and operational boundaries and any limitations that stem from infrastructure constraints and regulatory or market requirements.

Integration with Project Objectives

The GreenTurn project goals of urban logistics decarbonization and digital transformation and social impact guide each pilot use case. The alignment process enables local pilots to support cross-project learning and best practice development while maintaining flexibility to address site-specific priorities.

Foundation for Scenario Development

The established use case provides the base for the following methodology stages which include alternative scenario development, evaluation, stakeholder consultation and minimum viable product (MVP) selection for implementation. The project achieves maximum relevance and replicability across different urban settings through its use of clearly defined and collaboratively established use cases for each pilot.

2.2 Development and Evaluation of Alternative Scenarios

The GreenTurn project implements its pilot implementation process through the scenario development and evaluation phase aiming to identify multiple alternative logistics configurations through systematic design and assessment methods which result in selecting the most effective solution for each pilot city.

Identification of Alternative Scenarios

The project team works with local stakeholders to create multiple feasible logistics scenarios based on the established use case. The developed alternatives show both evolutionary progress from current practices and revolutionary changes such as low-emission vehicle adoption and advanced orchestration platform implementation. The scenario design process actively incorporates local constraints and opportunities through its analysis of regulatory environments and available infrastructure and customer requirements and business objectives.

Definition of Evaluation Criteria

A consistent set of possible evaluation criteria is established to ensure objective and transparent assessment of all proposed scenarios. These criteria are adapted to local priorities but typically include:

1. **Regulatory compliance**: Alignment with municipal, national, and European policy frameworks.
2. **Environmental impact**: Potential for reducing emissions and improving air quality.
3. **Technological integration**: Degree of digitalization, automation, and data-driven decision support.
4. **Operational feasibility**: Practicality of implementation within existing systems and resources.
5. **Scalability and agility**: Ability to expand or adapt in response to changing demands or regulatory requirements.
6. **Economic viability**: Cost-effectiveness and financial sustainability.
7. **Social impact**: Implications for worker well-being, client satisfaction, and urban quality of life.

Scenario Assessment Process

The evaluation process for each scenario uses both qualitative and quantitative methods to assess the defined criteria. The assessment tools consist of multi-criteria decision analysis and stakeholder scoring workshops and simulation modeling and benchmarking against relevant best practices. The evaluation of each scenario includes quantitative indicator calculations of when data is available for emissions reductions, vehicle kilometers traveled, delivery time improvements etc. The assessment team collects qualitative data through methods such as stakeholder feedback or expert review processes.

Stakeholder Consultation and Consensus Building

The scenario evaluation process includes repeated stakeholder consultations to guarantee that the assessment incorporates multiple operational realities and stakeholder perspectives. Feedback loops enable the improvement of scenarios and the modification of assumptions and the verification of result robustness. The participatory approach helps stakeholders accept the final selection while making it more relevant to their needs.

Selection of the Preferred Scenario

The scenario which achieves the highest performance level based on the agreed criteria after comprehensive evaluation will be chosen. The selected configuration serves as the foundation for designing and implementing and monitoring the pilot program in each city. The documentation of discarded alternatives together with selection reasons provides transparency while enabling cross-site comparison and knowledge transfer throughout the GreenTurn project.

2.3 MVP Design and Operational Planning

After selecting the most suitable scenario in each pilot, the methodology moves from concept evaluation to a structured MVP description. In this deliverable, this step is limited to defining what each pilot will implement and what the chosen configuration will test, at a high level. The aim is to present the MVP in a consistent way across pilots, so the reader can quickly understand the scope, the operating logic, and the core elements that shape delivery and return operations.

For each pilot, the MVP definition includes the following elements:

- **Pilot operating area and spatial scope:** Define the delivery geography and the boundaries within which the pilot will run.
- **Delivery mode and vehicle type:** Specify the vehicle category or delivery mode used to execute the pilot operations.
- **Digital or behavioral layer:** Identify the digital tools or behavioral mechanisms that support planning, coordination, or user engagement during the pilot.
- **Operating parameters to be tested:** Describe the main operational settings that influence performance, such as consolidation rules, time slot settings, and delivery and return integration.

Detailed implementation planning, including infrastructure preparation, system integration, operational monitoring arrangements, and reporting routines, is handled in the implementation and evaluation work and is documented in Deliverable D4.1.

2.4 Alignment with Urban Mobility Plans (SUMP/SULP)

The GreenTurn project requires each pilot to follow specific urban mobility frameworks which include Sustainable Urban Mobility Plans (SUMP) and Sustainable Urban Logistics Plans (SULP) and their corresponding national or regional policy instruments. The alignment process enables pilots to fulfill both short-term operational requirements and support urban sustainability goals and regulatory needs and city strategic plans.

Collaborative Planning and Policy Dialogue

The design and implementation process includes continuous communication with municipal authorities and planning agencies and relevant policy stakeholders. This facilitates:

1. Early identification of synergies or conflicts with ongoing city initiatives.
2. Joint adaptation of pilot features to maximize policy coherence and regulatory compliance.
3. Sharing of pilot data and interim results to support policy learning and potential scaling or replication in other city districts.

Documentation and Reporting of Alignment

The methodology requires systematic documentation of how each pilot relates to or affects SUMP/SULP priorities for transparency and replicability purposes. This involves:

- Tabular mapping of pilot actions or features to relevant SUMP/SULP objectives.
- Inclusion of compliance checklists or summary tables in project deliverables.
- Integration of policy alignment results into pilot evaluation and knowledge transfer activities.

Continuous Review and Adaptive Alignment

The project includes built-in review mechanisms for each pilot because urban mobility strategies change over time. This enables the project team to:

- Track policy developments and adjust operational protocols accordingly.
- Integrate feedback from planning authorities into ongoing pilot refinement.
- Ensure that pilot outcomes continue to support, and not diverge from, the city's sustainable mobility and logistics goals.

The GreenTurn methodology ensures that each local pilot demonstrates technical and operational innovation while serving as a catalyst for policy implementation and learning and long-term impact in sustainable urban logistics through these steps.

2.5 Testing, Validation and Feedback Integration

The GreenTurn methodology requires thorough testing of pilot solutions together with systematic feedback collection from all stakeholders. The method enables evidence-based adaptation through pilots that produce meaningful replicable results which fulfill both local and project-wide objectives.

Testing and Validation Approach

The pilot cities conduct multiple validation stages which start with pre-pilot trials followed by operational pilots. The testing process begins with structured pre-pilot trials that evaluate new vehicles and digital platforms and operational workflows in controlled or limited real-world environments. The testing phase confirms that systems operate correctly while verifying process dependability and system component integration.

The operational pilot stage begins after successful pre-pilot trials to test solutions in real operational settings. The project team gathers data about defined KPIs while observing user experience and searching for operational bottlenecks and unforeseen challenges.

The collected data undergo systematic analysis to determine performance levels against predetermined targets. The evaluation of the pilot's impact receives comprehensive assessment through quantitative results which are supported by qualitative feedback from logistics staff and business clients and municipal partners.

Feedback Integration and Adaptive Management

The process of continuous improvement relies on feedback loops that are structured:

1. All participant groups receive regular consultations and feedback sessions as part of stakeholder feedback. The project uses feedback from drivers and clients and local authorities and technical partners to detect problems and confirm achievements and suggest operational or technological improvements.
2. The workflows and system configurations and resource allocations receive immediate updates based on lessons learned during testing and pilot operation. The methodology promotes quick prototyping alongside flexible adaptation and clear documentation of all modifications.
3. The project shares validation phase insights from each pilot city to facilitate learning across the project while speeding up the implementation of effective practices in different urban settings.

Ensuring Robustness and Replicability

The pilot methodology of GreenTurn includes rigorous testing and transparent validation and continuous feedback integration to achieve the following goals:

1. The solutions must operate dependably in actual urban logistics settings

2. The evidence-based approach helps stakeholders develop trust and acceptance through decision-making processes.
3. The best practices developed through this project will be easily replicable and scalable to different cities.

The project addresses recognized limitations through ongoing dialogue and methodological flexibility which includes differences in local infrastructure and data availability.

The GreenTurn methodology provides a standardized framework for urban logistics pilot design and evaluation and implementation yet remains flexible to accommodate unique city conditions. The steps outlined in this chapter serve as a shared framework for all pilots through their process from stakeholder engagement to KPI mapping and continuous improvement. The specific scenarios and operational models together with evaluation criteria and performance indicators emerge from the unique combination of local context and regulatory framework and strategic goals of each city. The following chapters show how each pilot city adapted the methodology to their specific needs and limitations and opportunities which influenced their approach and results. The flexible structure maintains methodological consistency and site comparison ability while optimizing solution relevance and effectiveness and replicability.

3. Prototyping of MVPs

3.1 Athens pilot/ElectroSmart

In this subsection, the Athens pilot, entitled ElectroSmart, is presented in detail, outlining the structure of the pilot's conceptualization and execution, beginning with the description of the pilot objectives and setup. Subsequently an analysis of the alternative scenarios considered is presented, coupled with the rationale behind the selected approach and the alignment with local Sustainable Urban Mobility Plans (SUMPs) and Sustainable Urban Logistics Plans (SULPs). Furthermore, the operational requirements, implementation steps, testing and validation methodology, as well as the expected challenges and associated mitigation strategies are discussed.

3.1.1 Description of the pilot

The Athens pilot project, called ElectroSmart, introduces a business-to-business (B2B) approach for sustainable last-mile deliveries and returns in the urban area of Athens, Greece (see Table 1). It is being developed through a partnership between LOGIKA, a leading logistics service provider (LSP) and KYOCERA, a well-known supplier of electronic and printing consumables. The pilot project mainly seeks to demonstrate how sustainable logistics practices can be integrated into existing business networks without compromising operational efficiency. The ElectroSmart project will use two Citroën Ami Cargo electric vans which are particularly suited to Athens' dense and complex road network, offering a fully electric solution compatible with the city's zero emission targets. Therefore, with the aim of boosting efficiency, LOGIKA also provides a last-mile orchestration platform that allows dynamic planning and optimized route planning, thus enabling continuous monitoring and adaptation based on data collected from real-time operations. This approach not only improves delivery reliability, but also supports better decision making, as routes and schedules can be quickly adjusted to meet changing traffic conditions, customer demands or environmental objectives.

Table 1. Overview of the ElectroSmart Pilot

Basic information	Description
Title of the Pilot	ElectroSmart
Region – Country	Aspropyrgos, Western Attica - Greece
Participants	LOGIKA (Logistics Service Provider), KYOCERA (Business Client), University of the Aegean
Type of pilot	Business-to-Business (B2B)
Short description	Use of electric vehicles combined with a last-mile orchestration platform for B2B deliveries and returns

The pilot is structured around business customers rather than individual consumers. As such, it focuses on B2B operations allowing for greater integration of deliveries and returns, leading to improved van loading factor and a reduction in vehicle kilometers travelled (VKT). By serving businesses directly (in this case businesses are using printer toners and spare parts for their own use), the pilot program can better anticipate demand patterns, optimize vehicle usage and therefore reduce emissions per delivery.

ElectroSmart is aligned with the Athens Sustainable Urban Mobility Plan (SUMP), supporting the municipality's efforts to regulate and limit access of polluting vehicles during peak city hours, while supporting broader national strategies under the Greek Climate Law to promote zero-emission mobility solutions in metropolitan areas. As such, the pilot is designed not only to comply with current regulations, but also to anticipate future environmental standards.

ElectroSmart represents an integrated model that combines electric mobility, smart orchestration and B2B logistics expertise. Considering all of the above, it is expected that the operational and environmental data collected during the pilot project will form the basis for evaluating its replicability in other regions or business contexts.

3.1.2 Main elements of the ElectroSmart pilot

This section describes the fundamental technological and operational elements underlying the ElectroSmart pilot, which form the basis for all the alternative configurations evaluated in the following scenarios. The design of the pilot is structured around four principal pillars: vehicle technologies, information technology systems, the spatial aspect, and operating parameters focused on consolidation and logistics optimization. Together, these elements provide the core framework for delivering efficient, sustainable, and scalable last-mile logistics solutions in urban and peri-urban contexts.

1. **Vehicle Technologies**

The pilot considers two primary vehicle types for urban and peri-urban deliveries:

- **Internal Combustion Engine (ICE) Vans:** Traditional delivery vehicles powered by conventional fuels that serve as a basis for evaluating current logistics practices, offering operational familiarity but facing increasing regulatory and environmental constraints (see Figure 1).
- **Electric Vans (Citroën Ami Cargo):** Fully electric delivery vehicles designed for zero exhaust emissions. The Citroën Ami Cargo vans (see Figure 2), with a load capacity of 400 liters and a range of 75 kilometers, is chosen for its compatibility with dense urban areas and evolving regulatory requirements, benefiting from exemptions under the Athens Ring Road program and contributing to national climate targets.

Figure 1. Internal combustion engine (ICE) van

Figure 2. Citroën Ami Cargo electric van

2. IT technology and time slots

A dedicated last-mile orchestration platform (see Figure 3 and Figure 4) is integrated into the pilot to enhance operational efficiency and sustainability. Its key features include:

- Real-time route optimization and dynamic scheduling based on traffic, delivery time windows, and vehicle status
- Management of delivery and return time slots, allowing the scheduling of operations according to customer availability and operational constraints
- Continuous monitoring and logging of operational data such as vehicle location, emissions, battery status and delivery performance
- Automated customer notifications and digital proof of delivery or returns
- Integration of both delivery and return processes for comprehensive workflow management

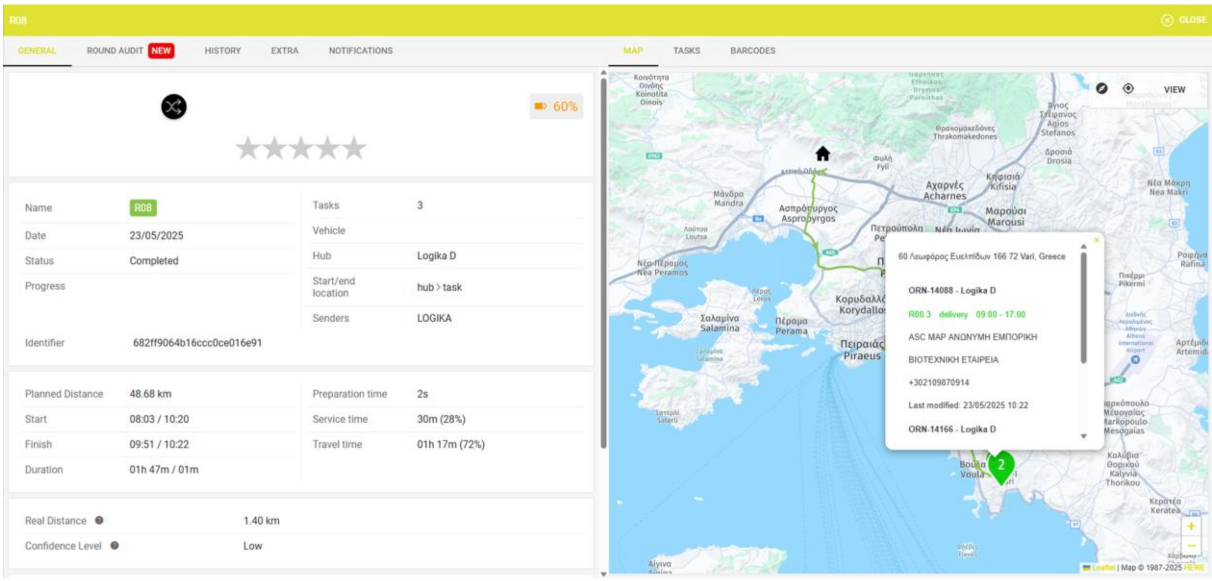

Figure 3. Dashboard interface of the last-mile orchestration platform showing a detailed map of the delivery route, delivery point information, vehicle status, and real-time task completion data for a representative delivery round in the ElectroSmart pilot

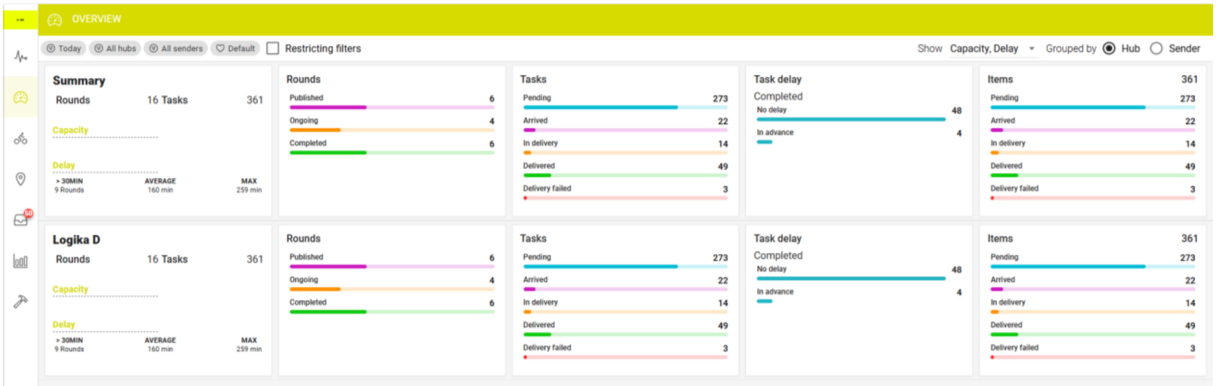

Figure 4. Summary dashboard of the last-mile orchestration platform illustrating operational performance indicators, including task status, delivery delays, and items counting across all rounds and hubs during a typical pilot day

In addition to transportation and information technology, the ElectroSmart pilot integrates two further foundational pillars that directly shape its design and operational potential: a) the spatial aspect and b) the key operating parameters.

3. Spatial Aspect

This pillar concerns the geographical distribution and spatial organization of logistics activities in the pilot project, taking into account the distribution of delivery zones, the density and dispersion of customers as well as the configuration of routes in urban and suburban environments. This analysis aims to optimize the allocation of resources, reduce vehicle kilometers travelled and adapt operations to varying urban densities, balancing operational efficiency with the flexibility required to serve different business customers in multiple areas, such as Elefsina, Aspropyrgos and other areas of West Attica.

4. Operating Parameters (Consolidation and Logistics optimization)

The operational parameters pillar focuses on the integration and coordination of logistics processes to maximize efficiency, reduce environmental impact and improve the service levels, which include:

- Product Consolidation: the pilot program allows Kyocera products (toners, spare parts, laser printers etc.) to be consolidated with those of other depositors, enabling shared vehicle loads and fewer delivery routes
- Customer Consolidation: Orders from Kyocera customers are consolidated across departments so that a single delivery can meet the needs of multiple departments, minimizing repeated stops at the same location
- Consolidation with Time Slots: Deliveries and returns are scheduled within defined time slots, facilitating efficient route planning and ensuring that customer preferences and operational constraints are respected

- Pickup and Delivery Integration: The last-mile orchestration platform supports both delivery and return operations within the same route, by integrating further logistics activities and reducing empty runs
- Single-Function Deliveries: The system can also accommodate operations that involve only deliveries or only pickups, depending on the logistical requirements of the client.
- Vehicle Payload Management: Payload optimization is central to the pilot's operational design, ensuring that the electric vans operate within their capacity limits while maximizing load factors and minimizing underutilized trips.

These key pillars ensure that the ElectroSmart pilot project is able to achieve the objectives of sustainability, regulatory alignment and replicability in different urban logistics environments.

3.1.3 Description and evaluation of pilot scenarios

The ElectroSmart pilot design in Athens received its structure through evaluation of multiple alternative logistics approaches. The evaluation process selected the configuration which best fulfilled operational feasibility requirements and environmental sustainability goals while following Athens' Sustainable Urban Mobility Plan (SUMP) and European climate targets. The evaluation team assessed each scenario through four essential criteria which included: a) regulatory compliance, b) emissions impact, c) technological integration and d) scalability potential and agility. These criteria are directly mapped into the four foundational pillars introduced in Section 2.2, ensuring a comprehensive assessment of each alternative and are defined as follows:

1. **Regulatory compliance:** This criterion evaluates the extent to which each scenario follows current municipal, national and European regulatory frameworks and considers vehicle access restrictions, emission standards, delivery timeframes and future policy developments that may affect logistics operations in Athens and similar urban environments.
2. **Impact on emissions**: The focus on this scenario's contribution is to reducing air pollutants and GHG emissions by considering both direct and indirect impacts on local air quality, including reductions in CO_2, NOx and particulate matter emissions, as well as broader alignment with city-level and national emissions reduction targets.
3. **Technological integration:** This criterion addresses the degree of integration of advanced digital tools, such as last-mile orchestration platforms or real-time monitoring systems, by examining the scenario's ability for data-driven planning, route optimization, performance monitoring and adaptability to future technological developments.

4. **Scalability & Agility:** Finally, this criterion addresses whether the scenario can be efficiently expanded to additional routes, customers, or regions without compromising effectiveness. It also considers agility, meaning the scenario's ability to adapt to operational changes, market shifts, regulatory uncertainty, or unforeseen costs that may affect its long-term viability.

The four foundational pillars described in Section 4.1.2, vehicle technology, information technology and time slot management, spatial configuration and operating parameters, directly influence the performance of each pilot scenario. The evaluation criteria applied in this section map to these pillars, allowing for a holistic assessment of how each scenario responds to operational, regulatory, technological and spatial challenges within the Athens context.

Scenario 1: Internal Combustion Engine (ICE) Vans

The first alternative envisioned the continuation of existing logistics practices, relying primarily on internal combustion engine (ICE) vans for last-mile deliveries (Figure 1). This scenario would have required minimal changes to operational workflows and infrastructure. However, its environmental drawbacks were substantial. ICE vans contribute significantly to urban air pollution and greenhouse gas emissions, outcomes directly at odds with Athens planned zero-emission zones and national climate commitments. Furthermore, the regulatory environment is increasingly unfavorable to fossil-fuel-based logistics, with restrictions on city center access tightening over time. Consequently, this option was deemed unsustainable and short-lived.

Scenario 1 (see Table 2) performs poorly across all criteria. It offers no emission reductions, lacks integration with digital logistics tools and does not align with regulatory trends. It requires no upfront changes, but its long-term viability is severely limited.

Table 2. Evaluation of Scenario 1 – ICE Vans

Evaluation Criteria	Score (1–5)*	Justification
Regulatory Compliance	1	Fails to meet current or anticipated emissions regulations in Athens
Emissions Impact	1	High greenhouse gas and pollutant output; misaligned with zero-emission goals
Technological Integration	1	No adoption of orchestration tools or digital planning infrastructure.
Scalability & Agility	2	Operationally familiar but unsustainable and exposed to increasing restrictions.

* Scores are on a scale from 1 (low) to 5 (high).

Scenario 2: Electric Vans without Last-mile orchestration platform

A second alternative scenario proposed the adoption of electric vehicles (EVs), such as Citroën Ami Cargo (Figure 2), without the integration of a last-mile orchestration platform. Under this model, electric vans would replace ICE vehicles for last-mile deliveries, providing immediate environmental benefits by eliminating tailpipe emissions during operations. This transition would allow the logistics operator to comply with the Athens "Daktylios" scheme and contribute to the city's zero-emission goals.

However, despite the emissions reduction, the operational structure would remain largely unchanged compared to conventional logistics models. Without intelligent route optimization, vehicle kilometers traveled (VKT) would likely remain high and delivery routes would not be dynamically adjusted to traffic conditions or client demands. As a result, load factors would not be consistently optimized, and vehicle utilization rates could fluctuate leading to inefficiencies in fleet management. Furthermore, the absence of real-time environmental performance monitoring would limit the ability to document improvements or adapt operations based on data-driven insights. While the use of electric vans alone would reduce direct emissions, the overall system would not achieve the operational or environmental efficiencies targeted by the GreenTurn project.

The second scenario (see Table 3) provides direct environmental and regulatory benefits through zero tailpipe emissions and clean mobility policy compliance. The absence of orchestration technology prevents logistics efficiency from reaching its full potential. The absence of dynamic routing and real-time data monitoring prevents operational gains from reaching their full potential, which makes this a partially aligned option.

Table 3. Evaluation of Scenario 2 – Electric Vans without Orchestration

Evaluation Criteria	Score (1-5)	Justification
Regulatory Compliance	4	Meets requirements under the "Daktylios" scheme and aligns with zero-emission mandates
Emissions Impact	4	Zero tailpipe emissions during operation; reduces local pollutants
Technological Integration	2	No last-mile orchestration platform; lacks route optimization or emissions monitoring
Scalability & Agility	3	Moderate potential but constrained by manual processes and inefficiencies

* Scores are on a scale from 1 (low) to 5 (high)

Scenario 3: Last-mile Orchestration Platform with ICE Vans

A third scenario examined the use of a last-mile orchestration platform without changing the existing fleet composition. In this case, the orchestration system would be applied to optimize routing, manage delivery time slots and improve overall fleet performance using conventional vehicles. This setup could potentially reduce vehicle kilometers traveled and improve load factors by introducing data-driven scheduling. It would also provide a means of tracking performance indicators such as delivery times, fuel consumption and emissions. While this model offered clear efficiency gains through digital optimization, its environmental impact remained limited by the continued use of internal combustion engine vehicles. Although the last-mile orchestration platform could support more strategic vehicle use and reduce idling and detours, the benefits were still constrained by the emission profiles of the vehicles in operation. Additionally, the model did not fully address regulatory shifts toward zero-emission transport and thus posed long-term compliance risks.

This scenario introduces smart planning tools, enabling better fleet utilization, route optimization and performance tracking. However, these benefits are constrained by the continued use of internal combustion engine vehicles. Table 4 shows the evaluation of this scenario where the last-mile orchestration platform improves logistics processes, the scenario does not meet emissions targets and may face increasing legal and policy risks.

Table 4. Evaluation of Scenario 3 – Last-mile orchestration platform with ICE

Evaluation Criteria	Score (1-5)	Justification
Regulatory Compliance	2	Fails to comply with long-term zero-emission targets despite optimized operations
Emissions Impact	2	Fossil fuel usage persists; emissions remain high despite efficiency improvements
Technological Integration	4	High integration of orchestration tools for planning, routing and monitoring
Scalability & Agility	3	Moderate scalability, but regulatory risks limit long-term applicability

* Scores are on a scale from 1 (low) to 5 (high)

Scenario 4: Electric Vans with last-mile orchestration platform

The fourth scenario examined the combination of electric vehicles (EVs) with a last-mile orchestration platform. The model used Citroën Ami Cargo electric trucks combined with a digital routing and scheduling system. The electric trucks operated with zero exhaust emissions, which met both Athens' zero-emission targets and the regulatory requirements of the Ring Road scheme. The last-mile orchestration platform provided intelligent planning capabilities that enabled real-time route optimization through traffic pattern analysis and customer needs assessment. The combined system reduced vehicle kilometers traveled (VKT) while enhancing load capacity and providing continuous emissions monitoring and reporting capabilities. The integrated system helped the logistics provider meet changing environmental regulations and achieve operational efficiency targets. The initial development required coordinated investment and training but produced long-term benefits of higher scalability and regulatory resilience along with quantifiable sustainability improvements.

As shown in Table 5, scenario 4 results with the highest evaluation across all criteria. The combination of electric vans with a last-mile orchestration platform supports full regulatory compliance, minimizes emissions and leverages advanced technological integration. These elements jointly ensure strong scalability and risk mitigation. This makes scenario 4 the most aligned with the pilot's environmental and operational objectives.

Table 5. Evaluation of Scenario 4 –Electric Vans with last-mile orchestration platform

Evaluation Criteria	Score (1–5)	Justification
Regulatory Compliance	5	Fully compliant with Athens' "Daktylios" and national climate legislation
Emissions Impact	4	Zero tailpipe emissions and reduced VKT due to optimized routing
Technological Integration	5	High integration of last-mile orchestration platform; real-time scheduling and monitoring
Scalability & Agility	3	Strong scalability, resilience to regulatory shifts and operational efficiency

* Scores are on a scale from 1 (low) to 5 (high)

To facilitate a clearer comparison of the primary logistics configurations examined for the Athens pilot (ElectroSmart), the following table (Table 6) provides a consolidated summary of each scenario, highlighting the essential features, key strengths and principal limitations of the four most relevant alternatives, thereby supporting an informed decision-making process regarding the optimal approach for sustainable last-mile logistics.

Table 6. Comparative evaluation of pilot scenarios – strengths, limitations and selection rationale

Scenario	Description	Strengths	Limitations
ICE Vans	Use of conventional internal combustion engine vehicles.	Requires no infrastructure change; operational familiarity.	High emissions; non-compliant with long-term regulations; limited future scalability.
Electric Vans without Orchestration	Transition to electric vehicles while retaining manual scheduling and routing.	Zero tailpipe emissions; regulatory compliance.	No optimization; limited efficiency; lack of real-time emissions tracking.

Orchestration with ICE vans	Use of digital routing and scheduling tools with conventional vehicles.	Improved routing; better fleet utilization; performance tracking.	Continued fossil fuel use; does not meet low-emission goals.
Electric vans with Orchestration	Integrated electric vehicles and last-mile orchestration platform.	Emission-free, optimized, transparent, compliant and scalable.	Requires initial coordination and investment.

Comparative scoring and selection of the preferred scenario

To complete the scenario assessment, **Błąd! Nie można odnaleźć źródła odwołania.** consolidates the scores across the four evaluation criteria and enables a direct comparison of the alternatives. The results show clear differences across scenarios. The combination of electric vans with a last-mile orchestration platform achieves the highest total score and provides the most balanced performance across regulatory compliance, emissions impact, and technological integration, while maintaining acceptable scalability and agility. This configuration aligns with Athens mobility and climate objectives, reduces emissions through zero tailpipe operation, and improves efficiency through route planning and time slot coordination. For these reasons, the pilot selects Scenario 4 as the preferred configuration for implementation.

Table 7. Comparative scenario scores across evaluation criteria

Scenario	Regulatory Compliance	Emissions Impact	Technological Integration	Scalability & Agility	Total Score
ICE Vans	1	1	1	2	5
Electric Vans without Orchestration	4	4	2	3	13
Last-mile Orchestration Platform with ICE Vans	2	2	4	3	11
Electric Vans with Last-Mile Orchestration Platform	5	4	5	3	17

* Scores are on a scale from 1 (low) to 5 (high)

Based on the comparative evaluation, Scenario 4 is retained as the reference MVP configuration for implementation. The next section defines the spatial scope and operating area used for deployment.

3.1.4 Pilot operating area and spatial scope

This section describes the selected ElectroSmart pilot configuration from an implementation perspective. It first defines the operating area and spatial scope using LOGIKA's historical delivery footprint and the subsequent narrowing of candidate zones. It then summarizes the rationale for selecting Elefsis as the pilot focus area, based on operational feasibility, regulatory conditions, and delivery and return patterns. Building on this spatial definition, the section introduces the operating parameters that will govern how the selected configuration is executed in practice

Selected pilot area and spatial scope

As shown in Figure 5, LOGIKA's historical delivery data, as presented in Deliverable D2.1, captures the full spatial distribution of deliveries from the past year. The map illustrates a broad array of delivery zones, with darker orange areas indicating the highest delivery frequency and lighter orange areas indicating moderate but still notable activity. The spatial footprint covers a wide part of Attica. In the western section, active delivery areas include Elefsis, Aspropyrgos, and Mandra. Moving toward the central region, several zones within Athens itself are highlighted, and additional delivery clusters appear in southern and eastern Attica. Among these are municipalities such as Glyfada, Kallithea, and Markopoulo, along with surrounding districts. This spatial overview demonstrates that LOGIKA's delivery network extends across both urban centers and less dense suburban regions. The delivery data presented in this figure supports the definition of the pilot's operating area, since it shows the diversity and geographical reach of logistics activities in the ElectroSmart distribution network. In this spatial footprint, the main goods correspond to KYOCERA B2B shipments, mainly toners, laser printers, and printer spare parts. The customers are businesses, and deliveries are performed directly to business premises such as offices, retail units, and other professional facilities.

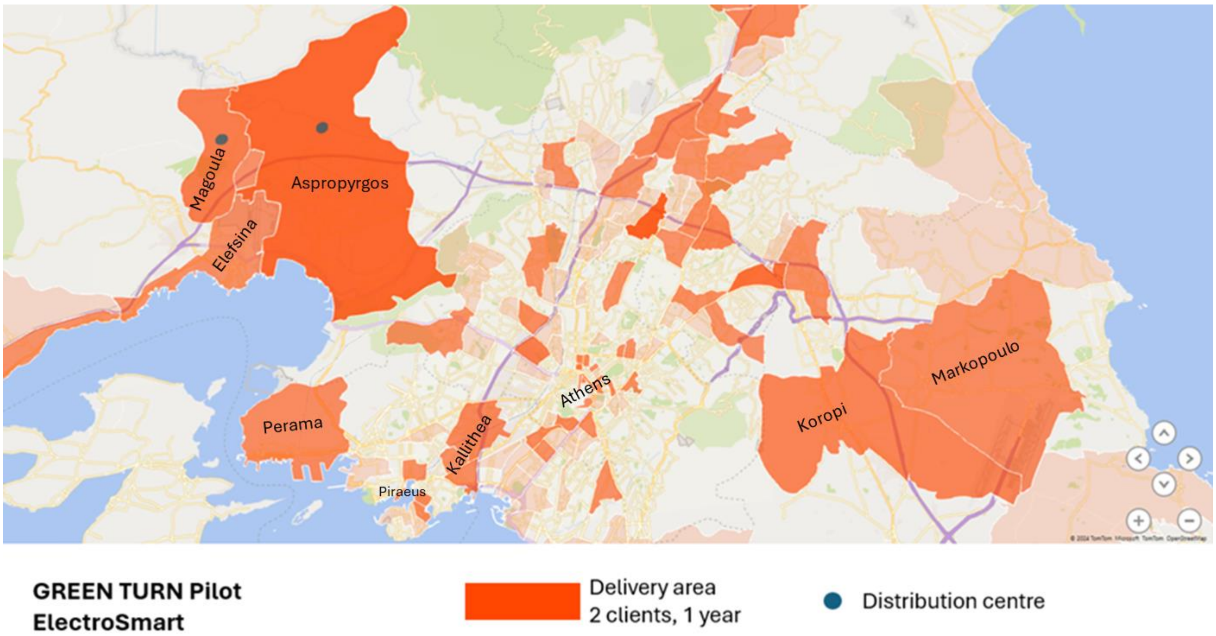

Figure 5. LOGIKA's delivery areas (2023–2024), with intensity of color reflecting frequency of deliveries. Source: Deliverable T2.1.

To support the planning and refinement of the pilot, Figure 6 shows the spatial layout of both potential and selected delivery territories. The light green areas represent possible pilot zones considered during the scenario analysis, while the dark green highlights the area ultimately chosen for pilot implementation. The figure summarizes how the selection process narrowed the scope from a broad set of feasible areas to a specific operational focus.

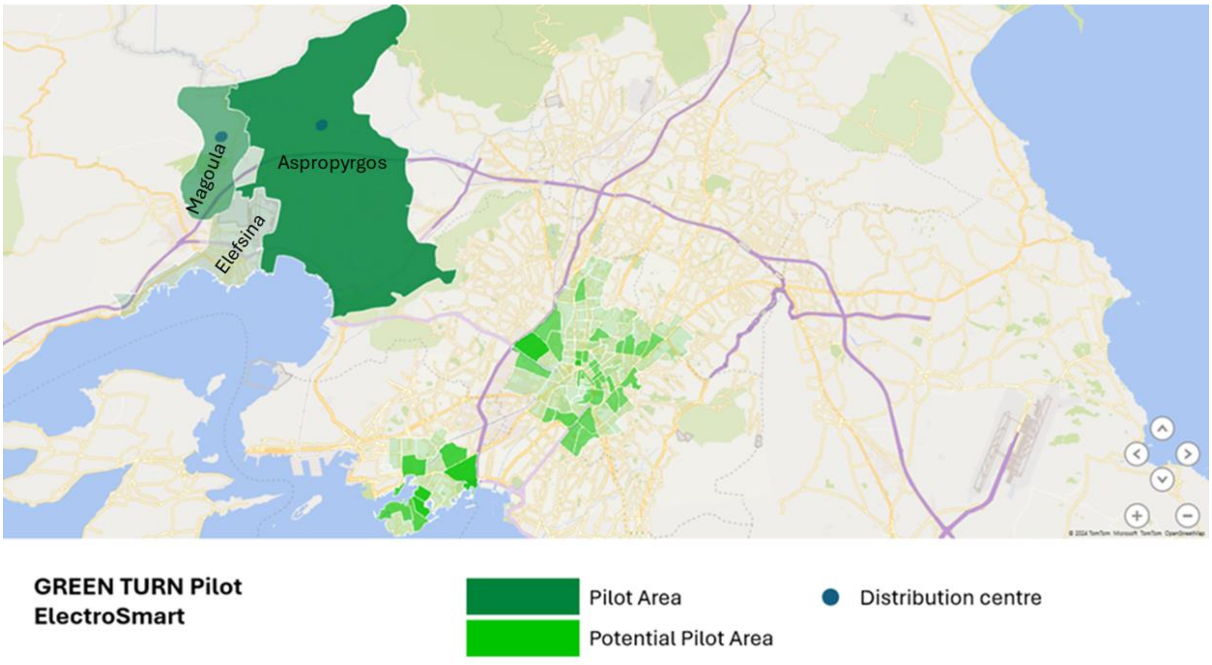

Figure 6. Pilot area (designated and potential). Source: Deliverable T2.1.

The delivery area selection process involved a systematic evaluation of candidate regions, considering operational feasibility, the regulatory environment, and historical delivery patterns. Table 8 summarizes the main characteristics, strengths, and limitations of central Athens, southern and eastern Attica, and western Attica, including Elefsis. Central Athens concentrates business clients, but strict time restrictions, heavy congestion, and complex regulatory demands create strong operational constraints. Southern and eastern Attica municipalities offer moderate opportunities, but routes tend to be longer and demand patterns to be less consistent. In contrast, Elefsis appears consistently as a core region in LOGIKA's delivery records and shows the highest volume of historical delivery and return activities. It also involves reduced regulatory complexity compared with central Athens and benefits from proximity to existing distribution centers. Although delivery density remains lower and travel distances can be longer, the selection of Elefsis is justified because it presents fewer regulatory obstacles and matches LOGIKA's current operational methods.

Table 8. Comparative assessment of candidate delivery areas for the ElectroSmart pilot—main characteristics, strengths, limitations, and quantitative evaluation based on regulatory fit and demand/operational potential

Delivery Area Option	Description	Strengths	Limitations	Regulatory Fit	Customer/Delivery Network Density	Total
Central Athens	Dense urban core, high demand, regulated environment	High delivery density; close to business clients	Strict time restrictions; heavy traffic; complex regulations; battery range of the van	4	3	7
Southern/Eastern Attica	Suburban and peri-urban municipalities (e.g., Glyfada, Markopoulo, Kallithea)	Moderate regulatory requirements; some demand concentration	Longer routes; less predictable demand	3	3	6
Western Attica (Elefsis)	Peri-urban, includes Elefsis,	Fewer restrictions; logistical	Lower delivery density; increase	4	5	9

Delivery Area Option	Description	Strengths	Limitations	Regulatory Fit	Customer/Delivery Network Density	Total
	Aspropyrgos, Mandra	simplicity; greater volume of deliveries and returns based on company's historical data	d distances; less visibility for policy goals			

* Scores for "Regulatory Fit" and "Demand/Operational Potential" are provided on a 1-5 scale, where 1 indicates low alignment and 5 indicates high alignment. "Total" reflects the sum of both criteria to facilitate ranking of options

While the spatial configuration defines the geographic and demand-related framework for logistics operations, achieving high operational efficiency and flexibility depends on targeted management of logistics processes and resource allocation. These elements are captured in the fourth pillar: operating parameters and logistics optimization.

3.1.5 Description of the most promising pilot scenario

Scenario 4 combines electric vans with a last mile orchestration platform and applies the selected spatial scope in Elefsis, Western Attica. In operational terms, the pilot relies on four pillars, vehicle technology, IT orchestration, spatial planning, and operating parameters. This section focuses on the operating parameters, since they define how LOGIKA consolidates shipments, manages time windows, and integrates returns in daily operations.

Operating parameters, consolidation and logistics optimization

The operating parameters pillar defines the methods used to consolidate deliveries and optimize logistics performance within the pilot. It improves resource use, reduces avoidable trips, and supports stable operations under real constraints.

Product consolidation. LOGIKA aggregates shipments from different depositors, including KYOCERA and third-party clients, so it can combine multiple shipments into a single delivery run. This increases load factor and reduces the number of journeys required.

Customer consolidation. LOGIKA consolidates orders for each KYOCERA customer across departments. Instead of servicing each department separately, the pilot organizes one visit that fulfils all departmental needs. This reduces redundant site visits and shortens route distances.

Consolidation with time slots. LOGIKA schedules delivery and return operations within predetermined time windows. This supports route planning and respects client availability, while enabling batch deliveries and pickups.

Pickup and delivery integration. The orchestration platform integrates deliveries and returns within the same trip when feasible. This reduces empty return runs and improves vehicle utilization.

Single function operations. The pilot keeps flexibility and can execute delivery only or pickup only trips when daily demand or client requests require it.

Vehicle payload management. The platform supports payload monitoring, so vehicles operate within capacity while maintaining high load factors. This reduces underutilized trips and supports both emissions reduction and cost efficiency.

Table 9 summarizes the key identifying details of the selected MVP configuration and serves as a reference for the operational description that follows.

Table 9. Athens Pilot (ElectroSmart) Identification

Pilot's ID	
Pilot's ID	GreenTurn-ATH-ES-101147942
Title of the Pilot	ElectroSmart
Description	B2B sustainable last-mile deliveries and returns using electric vehicles and a last-mile orchestration platform in the urban area of Elefsis, Athens, Greece.
Mode of transportation	Citroën Ami Cargo electric vans
Spatial information	Elefsis, Western Attica (Athens Metropolitan Area); operations between LOGIKA warehouse (Melissia, Aspropyrgos) and business clients in Elefsis
Information technology	Advanced orchestration platform for route optimization, scheduling, real-time monitoring, automated customer notifications, and performance tracking
Parameters tested	Product consolidation, Customer consolidation, Consolidation with time slots, Pickup and delivery integration, Single-Function operations, Vehicle payload management

<u>Operational process overview</u>

This subsection provides a concise overview of how the ElectroSmart pilot will operate on a daily basis in the selected area of Elefsis. It describes the core workflow for deliveries and returns at MVP level and clarifies how LOGIKA will use the Citroën Ami Cargo electric vans together with the last mile orchestration platform to support consolidation, time slot adherence, and efficient routing. The aim is to explain the operational logic of the pilot without presenting internal work instructions.

Deliveries

LOGIKA will prepare shipments at the warehouse in Melissia, Aspropyrgos and load the electric vans based on the delivery sequence generated by the orchestration platform. Before dispatching, LOGIKA will register all necessary delivery inputs in the platform, including delivery addresses, agreed time slots, customer requirements, and shipment characteristics that influence loading and routing. The platform will then generate an optimized route plan that accounts for traffic conditions, time windows, and vehicle range, and it will provide drivers with a digital manifest and routing guidance. During execution, LOGIKA will track route progress through the platform and record delivery completion digitally, ensuring that each stop is documented in a consistent way for later analysis.

Returns (reverse logistics)

Returns will be handled through the same operational framework and integrated into delivery rounds where feasible. Business clients will initiate return requests through the agreed channel and LOGIKA will register return details in the orchestration platform. The system will then allocate pickup points and collection windows and, when possible, combine return pickups with planned delivery routes to avoid additional trips. Drivers will collect return parcels during the delivery round, record pickup confirmation digitally, and transport returns back to the warehouse. Upon return, LOGIKA will receive and register returned items according to the digital manifest, ensuring traceability and completeness of records.

Operational data and monitoring inputs

Throughout both deliveries and returns, the orchestration platform will capture operational data that supports monitoring and evaluation of the pilot. This includes route and stop timestamps, distance travelled, battery usage, time slot compliance, delivery and pickup completion records, and exceptions such as delays or route deviations. LOGIKA will use these records to review operational performance, refine routing and consolidation settings, and document the operational and environmental performance of the selected MVP configuration.

3.1.6 Alignment of pilot with local SUMPs/SULPs

The ElectroSmart pilot was designed to align with both the Sustainable Urban Mobility Plan (SUMP) of Athens and broader national and regional mobility strategies. The Athens SUMP promotes a shift toward low-emission urban transport modes by emphasizing the need to reduce greenhouse gas emissions, improve air quality and create more livable urban spaces. The choice of electric vehicles for last-mile logistics directly supports these objectives, as it contributes to lowering air pollutants while fitting within the city's long-term vision for sustainable mobility.

Furthermore, the regulatory framework currently enforced within Athens, particularly the "Daktylios" access restrictions, reinforces the necessity for low-emission logistics solutions, since access to the city center is restricted based on license plate numbers, while electric vehicles are exempt from these limitations. This regulatory environment directly supports the operational feasibility of the pilot by allowing the electric vans to circulate freely without time-based entry restrictions that would otherwise apply to internal combustion vehicles. Additionally, decision number 177/2022 of the Regional Council of Attica establishes delivery time constraints and vehicle weight limitations for urban freight, further incentivizing the adoption of lightweight electric vehicles for daily logistics operations (Municipality of Athens, 2021).

The national climate law adopted by Greece in 2022 further strengthens the strategic alignment of the pilot, as it sets ambitious targets for the electrification of urban transport fleets, including the requirement that all new taxis and a significant share of rental vehicles in Athens be electric by 2025. Although the pilot operates in the logistics sector rather than passenger transport, its focus on zero-emission operations contributes to the overarching goal of reducing transport-related emissions across all sectors. By operating within this policy environment, the ElectroSmart pilot not only complies with existing regulations but also anticipates future trends, thereby enhancing its potential for long-term viability and scalability.

In addition to local and national alignment, the pilot is consistent with the objectives set by the European Union's Sustainable and Smart Mobility Strategy, which calls for the decarbonization of transport and the promotion of clean and digital technologies. Through the integration of electric mobility and a dynamic orchestration platform, the Athens pilot addresses both pillars by advancing environmental sustainability and supporting digital innovation in logistics management.

A summary of the pilot's alignment with the key objectives and actions from the Athens SUMP and SULP is presented in Table 10. The table shows how the ElectroSmart pilot directly implements the main policy directions established at both the municipal and regional levels thus supporting the city's mobility and logistics strategies.

Table 10. Alignment of ElectroSmart Pilot features with Athens SUMP and SULP objectives

Policy Objective / Action	SUMP or SULP	Addressed by ElectroSmart Pilot
Promote use of electric vehicles for logistics	SULP	Two electric vans used for all deliveries
Optimize delivery schedules	SULP	Dynamic orchestration platform; off-peak routes
Reduce emissions and improve air quality	SUMP/SULP	Zero tailpipe emissions; continuous monitoring
Compliance with delivery time restrictions	SULP	Delivers within allowed hours, uses eligible vehicles

Policy Objective / Action	SUMP or SULP	Addressed by ElectroSmart Pilot
Collaboration with logistics stakeholders	SULP	LOGIKA-KYOCERA partnership and business network
Enhance efficiency in urban logistics	SULP	Route optimization, real-time adaptation
Improve pedestrian/public space accessibility	SUMP	Indirect (reduces truck presence in dense urban core)
Multimodal and sustainable transport options	SUMP	Partial (focus on e-vans, could expand in future)
Minimize noise and congestion	SULP	Electric vehicles: optimized schedules avoid peak times

3.1.7 Operational requirements

The ElectroSmart pilot will operate in Elefsis, Western Attica, using Citroën Ami Cargo electric vans supported by a last mile orchestration platform. This section defines the operational requirements that enable stable execution of the selected MVP, focusing on roles, resources, monitoring routines, and control mechanisms.

Operational governance and responsibilities

The pilot requires coordination between the logistics operator, the business client, and the technology provider. Each partner contributes distinct inputs to ensure consistent operations and traceability.

LOGIKA (Logistics Service Provider)

LOGIKA runs daily pilot operations and manages the execution of deliveries and returns between the warehouse in Melissia, Aspropyrgos and business clients in Elefsis. LOGIKA is responsible for vehicle availability, charging readiness, route execution, and the integrity of operational records. LOGIKA also consolidates operational data from the orchestration platform and shares progress updates with the project team.

KYOCERA (Business client)

KYOCERA supports the pilot by defining delivery and return requirements, confirming client constraints (for example preferred time windows and access conditions), and facilitating communication with participating business locations. KYOCERA also provides structured feedback on service quality and return handling.

Orchestration platform provider (Technology partner)

The technology partner ensures stable platform operation, supports onboarding and user access, and provides technical support when issues arise. The partner also maintains data logging functionality and supports configuration updates when pilot feedback requires changes in routing rules, time slot settings, or operational dashboards.

Operational resources and dependencies

To operate the MVP reliably, the pilot requires the following baseline resources and dependencies:

- **Vehicles and charging capacity:** Two Citroën Ami Cargo electric vans and charging capability at the LOGIKA warehouse, ensuring vehicles start daily rounds with sufficient range for the planned routes.
- **Platform access and configuration:** Active user accounts, role permissions, and a configured operating area for Elefsis, including routing constraints and time slot rules.
- **Order and return inputs:** A consistent process for capturing delivery addresses, contact points, time windows, and return requests so the platform can generate feasible routes.
- **Driver readiness:** Staff training that covers platform use, exception handling, and basic EV operating practices relevant to daily dispatch.
- **Operational communication channels:** Agreed channels for day-to-day coordination between LOGIKA, KYOCERA, and the technology partner, including escalation paths for urgent issues.

Compliance monitoring and coordination

LOGIKA will monitor compliance requirements that affect pilot operations, especially access restrictions, time related delivery limitations, and any local regulatory updates relevant to commercial vehicles in the pilot area. LOGIKA will translate regulatory changes into practical operating rules, such as route constraints, delivery windows, or access instructions for drivers. When compliance requirements change, LOGIKA will inform KYOCERA and the technology partner so the platform configuration and operational planning stay aligned.

Monitoring and data collection

The pilot will rely on systematic monitoring to support operational control and post-pilot evaluation. The orchestration platform will capture operational records during both deliveries and returns. LOGIKA will use these records to review performance trends and identify exceptions that require corrective action.

The monitoring inputs include, at minimum:

- Route and stop timestamps (dispatch, arrival, completion)
- Distance travelled and route deviations

- Battery usage and charging events, where available through vehicle or platform records
- Time slot compliance and service reliability events (late arrivals, missed deliveries, rescheduling)
- Delivery and pickup confirmations
- Exceptions and incident logs (traffic disruptions, access issues, platform downtime)

LOGIKA will review these records at regular intervals and share structured summaries with the project team. The pilot will use the summaries to support operational adjustments, documentation of lessons learned, and transparency across partners.

Issue management and continuous improvement

LOGIKA will apply a simple incident management routine to keep operations stable:

- LOGIKA records operational incidents and exceptions in a consistent format.
- LOGIKA classifies issues by type (vehicle, access, routing, customer availability, platform function).
- LOGIKA escalates technical issues to the technology partner and operational issues to the internal operational lead.
- LOGIKA applies corrective actions, then checks whether the same issue repeats in subsequent rounds.

This approach supports continuous improvement without introducing excessive procedural complexity. It also helps the pilot maintain traceability of what changed, why it changed, and what effect it had on operations.

Data protection and confidentiality

The pilot will handle operational and customer related information according to applicable privacy and data protection requirements. LOGIKA and the technology partner will ensure that user access is role based and that operational records are stored and shared only for pilot purposes. Where possible, the pilot will use aggregated reporting for progress summaries.

Risk management and contingency planning

The pilot will apply preventive controls and contingency measures to protect operational continuity, such as maintaining vehicle readiness, ensuring backup communication methods, and applying basic procedures for platform interruptions. The detailed risk list and mitigation actions are described in the dedicated risk mitigation subsection of the Athens pilot.

3.1.8 Implementation steps and processes

This section summarizes the sequence of steps used to deploy the ElectroSmart pilot in Elefsis, Western Attica. It presents the MVP level implementation plan and clarifies what each phase delivers. LOGIKA will maintain more detailed operating procedures internally and update them based on pilot feedback.

Progress overview

The implementation is structured in four main phases:

1. Pre-pilot Validation
2. Set-up and integration
3. Pilot Execution
4. Continuous evaluation and adjustment

Phase 1, Pre pilot validation

LOGIKA validates the electric vans and the orchestration platform under controlled conditions before living operations. The team confirms vehicle range, loading routines, and basic reliability on representative routes in the pilot area. In parallel, the team configures the platform for the Elefsis geography and the KYOCERA delivery requirements, then verifies that route generation and data logging work as expected.

Phase 2, Set-up and integration

LOGIKA prepares the operational environment at the warehouse in Melissia, Aspropyrgos. The team ensures charging capability, sets user access and roles, and connects the orchestration platform with existing order and shipment tracking routines. The team also finalizes communication rules with KYOCERA and confirms contact points and service expectations for participating in business locations.

Phase 3, Pilot execution

LOGIKA starts scheduled business-to-business (B2B deliveries and returns using the selected configuration, electric vans supported by the orchestration platform. The team executes daily rounds in the Elefsis area and uses time slots and consolidation rules to reduce repeated visits and improve route efficiency. The pilot also integrates returns into regular rounds where feasible.

Phase 4, Continuous evaluation and adjustment

During live operations, the team reviews monitoring indicators and stakeholder feedback at agreed intervals. The reviews identify bottlenecks, confirm compliance, and support practical adjustments to routing rules, time slot settings, loading routines, and communication procedures. The team documents lessons learned and uses them to refine the MVP before scaling or transfer to other areas.

3.1.9 Testing and validation approach

This section describes the testing and validation procedures for the ElectroSmart pilot before its deployment at full scale. The validation process verifies that electric vehicles and orchestration platform fulfill operational needs and function dependably in actual operational settings. The pilot evaluates performance indicators and technical capabilities and user experience through systematic assessment to reduce risks and ensure a successful launch.

Testing environment and scope

The validation process starts with real-world testing of two Citroën Ami Cargo electric trucks on representative delivery routes in the suburban area of Elefsina. The chosen routes will demonstrate the actual operating conditions of the pilot by including traffic congestion, variable distances, and controlled access zones. The test aims to verify that the vehicle meets its expected performance standards for autonomy, load capacity, and operational reliability during the pilot program. Key performance indicators (KPIs) defined in Section 4.1.8, such as vehicle kilometers traveled (VKT), average delivery time, and energy consumption, will be used to assess results at this stage.

Platform validation and performance tracking

After validating the vehicles, the orchestration platform will be tested to verify its support for all pilot requirements. The testing process will verify the route optimization function and data logging capabilities for travel distances, delivery times, and real-time driver communication support. The platform will receive particular focus regarding its data collection and organization capabilities for performance indicator calculations, including emissions-related data, as appropriate. These functions will be examined under conditions reflecting actual delivery and return operations.

Data collection and feedback integration

During the testing phase, comprehensive data will be collected at every stage of the delivery and return process, including vehicle tracking data, delivery and return timestamps, battery consumption, and route efficiency measurements. In addition to the operational data collected by the orchestration platform, feedback will be sought from drivers and other logistics personnel to identify practical problems and opportunities for improvement. User experience and satisfaction, as well as any technical or procedural issues, will be recorded and reviewed to ensure that both the electric trucks and the digital platform meet the requirements of daily logistics operations. All personal data will be processed in accordance with applicable data protection legislation.

Pre-pilot trials and final adjustments

Pre-pilot testing will be conducted in the selected pilot area to test the system in real delivery conditions prior to full implementation. These trials will fully replicate delivery and return operations with real routes and customer interactions, as well as all operational procedures. The main objective is to validate the reliability of the system, optimize route planning, and ensure seamless integration between electric trucks and the orchestration platform. Any discrepancies and shortcomings identified during these tests will be analyzed and the corresponding adjustments will be made to workflows, platform settings, and staff protocols. The findings from the pre-pilot phase will be incorporated into the development plan in order to reduce operational risk and ensure a smooth transition to actual operations.

The ElectroSmart pilot executes a structured testing methodology which combines real-world testing with platform validation and data analysis and pre-pilot trials to verify all technological and operational elements before full deployment. The operational success and environmental performance evaluation will be guided by the performance indicators established in Section 4.1.8. The method helps identify potential issues early on which results in a successful pilot launch with robust and reliable results. The validation phase delivers crucial information that guides future improvement work and proves stakeholder confidence regarding ElectroSmart model scalability and urban logistics application potential.

3.1.10 Expected challenges and risk mitigation

The Athens ElectroSmart pilot faces various operational and technological and regulatory obstacles which come with transitioning to sustainable urban logistics. The following section identifies the principal obstacles which will occur during pilot deployment and presents corresponding risk mitigation strategies. The goal is to guarantee the reliability and scalability and long-term sustainability of the pilot within the dynamic urban environment of Elefsis and the broader Athens metropolitan area.

1. **Operational Reliability of Electric Vehicles**

The Athens ElectroSmart pilot faces an essential operational challenge because the Citroën Ami Cargo electric vans have restricted operational distances and variable performance capabilities. The delivery and return operations may be restricted by the 75 km practical range of vehicles because unexpected detours and additional stops and heavier payloads could occur. The efficiency of the battery may be affected by temperature changes and the weight of the consolidated goods. These factors create the possibility of routes being cut short and require unplanned charging and disrupt the continuity of service.

The solution to this problem involves daily route planning to keep total travel distances under the vehicles' maximum range while considering possible detours and operational delays. The company will perform scheduled vehicle maintenance and battery checks to achieve optimal performance. The drivers will get specific directions to check battery levels during their trips and notify their supervisors about any fast battery drain. The delivery schedule will be adjusted when battery levels reach critical points or a backup vehicle will be sent to finish the route to prevent service interruptions.

2. **Charging Infrastructure and Turnaround**

A notable challenge for the Athens ElectroSmart pilot concerns the turnaround time required for recharging the Citroën Ami Cargo electric vans. The standard socket outlet charging of these vehicles at the LOGIKA warehouse faces two challenges: a) the extended charging duration and b) the need for coordinated vehicle charging, which limits operational flexibility when deliveries have strict schedules. The delivery cycles could experience disruptions, and the fleet availability would decrease because of unplanned charging delays and simultaneous van charging needs.

The solution to this challenge involves scheduling vehicle charging after each operational cycle to charge both vans completely before the next delivery round. The staff members will start charging the vehicles right after each delivery to reduce the overall charging duration. The two vehicles can use separate standard outlets for simultaneous charging, and the delivery schedules will be modified to prevent conflicts. The system will reschedule non-urgent deliveries to maintain essential operations when unexpected delays occur.

3. **Route Optimization and Real-Time Adaptation**

Another challenge is that the effectiveness of last-mile operations in the Athens ElectroSmart pilot depends heavily on the orchestration platform's ability to optimize delivery and return routes. The execution of planned sequences becomes complicated when unexpected traffic congestion or road closures or urgent client requests occur, which results in longer travel times. The platform needs real-time data integration capabilities to make quick route adjustments because this ensures both service reliability and operational efficiency.

To mitigate this challenge, the orchestration platform will be configured to allow for route modifications in response to reported incidents or changing conditions. The delivery staff will receive training to contact dispatch or logistics coordinators directly when encountering unexpected delivery challenges so they can receive manual assistance or delivery priority adjustments. The route planning process will include operational buffers to handle small delays while post-delivery reviews will help optimize routes through actual experiences and customer feedback.

4. **Company Behavior and Order Patterns**

The Athens ElectroSmart pilot involves business clients who use different methods for placing orders. In some cases, companies sometimes combine their orders into joint submissions which enables better delivery planning and resource optimization. Companies that place individual orders at different times need to make multiple smaller deliveries instead of combining their orders. The different ordering patterns between clients will affect how vehicles are used and the scheduling operations.

Thus, this challenge will be addressed by keeping the project team in constant communication with all business customers to explain the benefits of order consolidation, which include synchronized delivery times and optimized route planning. The project team will regularly collect feedback to better understand the operational preferences of each company. Delivery schedules will be modified according to the different order patterns in order to achieve operational efficiency and satisfy the customers' needs.

5. Load Factor and Route Efficiency

The daily fluctuations in delivery demand together with changing delivery volumes affect both vehicle load factors and planned route efficiency. The vehicle utilization rate can reach its highest point during certain days when multiple orders can be combined but other days result in less consolidated routes which may cause underutilized trips and longer travel distances.

To mitigate this, the orchestration platform will analyze order consolidation opportunities and optimize delivery routes through analysis of current demand patterns. The delivery schedules will receive regular assessments to optimize load factors whenever possible. The project team will study operational data to develop better delivery planning methods which will help maintain efficient resource utilization throughout time.

6. Technology Downtime and System Continuity

Another challenge is that delivery operations can be disrupted when digital systems, including the orchestration platform and communication devices, are temporarily unavailable. Delivery operations may experience delays due to technological outages that occur either planned or unexpectedly when staff need access to delivery schedules and route information and data logging processes.

To address this, operational procedures will include scheduled software updates and regular data backups performed during periods of low activity. The organization will prepare manual backup procedures that include printed delivery slips and alternate communication systems for use during technology outages. Staff members will receive training in these procedures to ensure continuity of service until full system functionality is restored.

The identified challenges represent the main operational and technological complexities which the Athens ElectroSmart pilot project will encounter. The risk mitigation strategies have been developed to tackle these challenges through proactive and adaptive measures. The pilot processes will benefit from ongoing operational data monitoring and stakeholder engagement to detect emerging risks early and enhance pilot operations continuously. This method will lead to long-term success and scalability and sustainability of sustainable urban logistics solutions in Elefsis and Athens region.

3.2 Zaragoza pilot/Green Button

This section will provide a detailed description and analysis of the Zaragoza pilot project, Green Button, which was implemented through the Mercadeando platform and can operate in two ways:

- Mobile app: Available for Android and iOS platforms. Allows to place orders and pay in a secure environment.

- Web application: Allows to make purchases from a web environment.

3.2.1 Description of the pilot

The Zaragoza pilot, called the Green Button, integrates retailers, customers, and logistics service providers (LSPs) to create more sustainable delivery & return options, and inclusive solutions for e-commerce logistics and last-mile delivery (see Table 11).

Social enterprises are also partners, particularly for addressing equity and inclusion in logistics.

The pilot takes place within Zaragoza's Low Emission Zone (LEZ) — specifically the Historic City Center Low Emission Zone (called "ZBE").

The pilot includes incentivizing purchases through a dedicated website, allowing for more efficient delivery planning (B2C). Deliveries can be made on foot in nearby postal codes or with the aid of small electric vehicles for longer distances. Planning based on orders placed through the website also allows for more energy-efficient routes.

In this way, Green Button aligns itself with Zaragoza's urban mobility plan. This is a Sustainable Urban Mobility Plan (SUMP) whose objective is to create a more efficient, healthy, and environmentally friendly transport system, as well as reduce emissions and pollution, and promote the use of bicycles and public transport.

Table 11. Overview of the Green Button Pilot

Basic information	Description
Title of the Pilot	Green Button
Region – Country	Zaragoza - Spain
Participants	Koiki (Logistics Service Provider), Zaragoza City Council (Public Authority),
Type of pilot	Government-to-Business-to-Consumer (G2B2C),

3.2.2 Main elements of the Green Button pilot

1. Application area:

It will be primarily applied in the low emission zone of the historic center of Zaragoza and may also reach the outlying neighborhoods.

2. Digital platform:

It's the main tool for connecting citizens, businesses, and logistics operators and includes the option for consumers to choose a sustainable delivery method for delivery or returns.

3. Gamification and incentive mechanisms:

- Discounts or points for choosing low-emission delivery.
- Rewards for sustainable local businesses.
- Visual information (scores, badges) to encourage eco-friendly behavior.

4. Sustainable logistics network:

- Electric or low-emission vehicles for last-mile delivery.
- Urban microhubs and shared pickup and drop-off points.
- Optimized routes and schedules to reduce traffic and emissions.

5. Social inclusion and accessibility:

The aim is for the sustainable logistics model to also generate social benefits, not just environmental ones.

- Participation of social enterprises that employ vulnerable groups.
- People with reduced mobility.
- Older adults or people with disabilities.

6. Administration Support Tools:

Development of dashboards and data analysis for the City Council:

- Monitor the number of sustainable deliveries.
- Evaluate avoided emissions.
- Measure the effectiveness of public policies (incentives, penalties, etc.).

3.2.3 Description and evaluation of pilot scenarios

The traditional delivery model lacks coordination between different retailers, resulting in disorganized access to the city's historic center by various logistics service providers (LSPs).

Similarly, it does not include a centralized hub for package drop-off and pick-up. Consequently, there is no centralized data system for package distribution and delivery.

The Zaragoza pilot includes multiple scenarios to test different route consolidation and logistics interventions.

Key scenarios are:

Scenario 1:

Consolidation of routes through the Central Market, i.e., combining several delivery routes so that shipments pass through a local hub (market) to consolidate the loads before final delivery.

The products arrive at the retailers of the Central Market in vans and from there (in addition to in-person purchases) orders placed through the Mercadeando web platform or mobile application, are delivered.

Deliveries can be made using electric vehicles or on foot, depending on the distance and the area covered (see Figure 7).

Figure 7. Central Market based route consolidation scenario, last mile delivery via low impact modes and inclusive delivery support through Atades

For local deliveries, the delivery company has an agreement with Atades, an organization that focuses on the employment of people at risk of social exclusion.

However, as shown in Table 12, the evaluation criteria do not achieve high scores.

Table 12. Comparative scenario 1 scores across evaluation criteria

Evaluation Criteria	Score (1–5)*	Justification
Regulatory Compliance	2	It complies with the basic regulations but does not align with the emissions reduction plan (2005-2030) and the creation of a Low Emission Zone in Zaragoza.
Emissions Impact	1	Difficulty in reducing traffic and the emission of polluting gases
Technological Integration	1	The basic tools, typical of an online shopping platform
Scalability & Agility	1	This scenario is difficult to scale, as it would imply an uncontrolled

		increase in traffic and emissions in the city center.

* Scores are on a scale from 1 (low) to 5 (high).

Scenario 2:

Similar consolidation of those routes, but with adjustments or modifications that yield further efficiency, in particular:

- Later distribution (i.e. delaying some distributions to combine more loads). This involves offering the possibility of making purchases in advance of the delivery date on the Mercadeando web platform or mobile application.

- Possibly better match of vehicle types; e.g. electric, refrigerated or deliveries on foot.

- It is also proposed the possibility of multiple purchases in one order through the Mercadeando web platform or mobile application, and multiple deliveries within predefined sectors to increase delivery efficiency.

Table 13. Comparative scenario 2 scores across evaluation criteria

Evaluation Criteria	Score (1-5)*	Justification
Regulatory Compliance	4	In addition to complying with basic regulations, it largely conforms to the emissions reduction plan (2005-2030) and the creation of a Low Emission Zone in Zaragoza.
Emissions Impact	3	Reduction of urban traffic and emissions of polluting gases
Technological Integration	3	Adaptation of the web platform to the sales and delivery system.
Scalability & Agility	3	The segmentation of orders and deliveries, and the possibility of multiple orders and deliveries, opens up the possibility of scaling the system.

* Scores are on a scale from 1 (low) to 5 (high).

Evaluation: Key Results and Trade-Offs

Distance traveled: Scenario 2 is estimated to achieve a considerable reduction in kilometers traveled, significantly greater than Scenario 1 compared to the baseline optimization.

Cost savings: Scenario 2 is expected to generate significant cost savings compared to Scenario 1. On the other hand, the baseline/SENATOR optimization is not expected to reduce costs.

Shipments/efficiency: We believe Scenario 2 will increase productivity (packages per hour) as well as shipping efficiency per kilometer.

Delivery times/delays: Scenario 2 is expected to reduce delivery times/delays, unlike the baseline optimization and Scenario 1.

Therefore, we observe that in the scenario design, route consolidation (if not precisely planned) can delay some deliveries.

Overall, the estimates seem to indicate that Scenario 2, being more complex, may better meet the environmental, cost, and efficiency objectives. Scenario 1, likely easier to implement, will probably have less impact.

3.2.4 Description of most promising pilot scenario

According to the analysis of the scenarios proposed in the previous sections, the following table (Table 14) shows the most promising Minimum Viable Product (MVP) scenario for the Zaragoza pilot.

Table 14. Zaragoza Pilot (Green Button) Identification

Pilot's ID	
Pilot's ID	GreenTurn-ZAR-GB-101147942
Title of the Pilot	Green Button
Description	G2B2C model focused on local services and fresh produce, involving local authority, retailers, LSPs and consumers, and addressing both environmental sustainability and social inclusion.
Mode of transportation	Electric tricycles, on foot.
Spatial information	From the Historic Center of Zaragoza (Central Market) to all neighborhoods of the city.
Information technology	Web platform/application for purchasing fresh products. Computerized delivery planning. Real-time process tracking and statistical analysis.
Parameters tested	Customer segmentation, distribution of activity by sector or postal code, distribution of activity by time and date. Use of the most sustainable options when making purchases.

Delayed delivery allows for route planning and optimization. To achieve this, the Mercadeando web platform or mobile application must offer consumers the option to choose a delivery date after the purchase date, essentially allowing them to buy in advance.

This enables the LSP to consolidate deliveries, plan and optimize its delivery routes.

In addition to this, Mercadeando would implement the sectorized multiple purchase option, that is, making a purchase with shipments to several different destinations, all of them located in a specific sector, allowing LSPs to optimize the delivery route, making it more efficient in terms of traffic and sustainability.

In essence, scenario 2 creates a micro-consolidation center model within the Zaragoza Low Emission Zone (LEZ), as seen in Figure 8, using the Central Market as a central urban node where packages from multiple logistics service providers are grouped, sorted and then redistributed via smaller vehicles, such as electric vans or cargo bikes, using optimized routes and time windows.

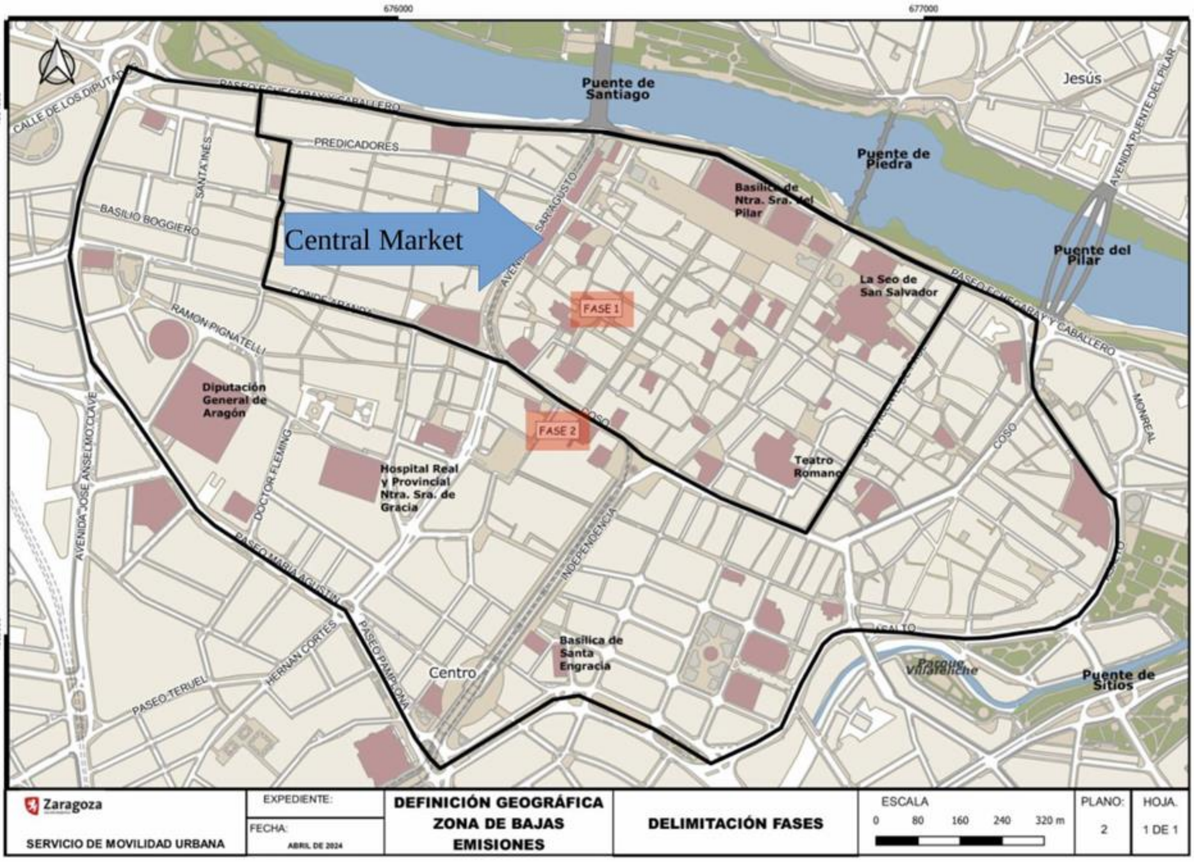

Figure 8. Location of the Central Market in Fase 1 and Fase 2 LEZ.

3.2.5 Alignment of pilot with local SUMPs/SULPs

The SUMP plan in Zaragoza aims to reduce the number of private vehicles circulating in the city.

Meanwhile, the SULP plan aims to reduce emissions, congestion, and the urban impact of goods delivery in the city; therefore, both plans are relevant to the Green Button pilot.

Therefore, the Zaragoza GreenTurn pilot, Green Button especially its Scenario 2, is fully aligned with both Zaragoza's SUMP and SULP.

It operates these plans' strategic objectives by demonstrating a scalable, data-driven, low-emission, and socially inclusive logistics model inside the city's Low Emission Zone (Abierto, 2016).

Zaragoza's Sustainable Urban Mobility Plan (SUMP) and its accompanying Sustainable Urban Logistics Plan (SULP) define long-term goals for:

- Decarbonizing urban transport, especially last-mile freight.
- Reclaiming public space from traffic for people.
- Integrating digital tools and smart data into mobility management.
- Supporting economic competitiveness of local retail and SMEs.
- Ensuring social inclusion and accessibility for all residents.

The GreenTurn pilot, implemented in the city's Low Emission Zone (ZBE) and coordinated by the Zaragoza City Council, directly supports these SUMP/SULP priorities.

Alignment with Zaragoza's Sustainable Urban Mobility Plan (SUMP):

- Scenario 2 of the pilot (micro-hub consolidation, green vehicles) reduces vehicle-km by ~32%, cutting CO_2 and NO_2 emissions in the city center.
- Integrates electric vans, cargo bikes, and pedestrian pick-up options for last-mile delivery within the LEZ.
- Fewer delivery trips through optimized routing and consolidation hubs lower freight traffic in dense central areas.
- Co-design with social enterprises ensures inclusion of mobility-impaired or digitally excluded citizens in delivery/pick-up solutions.
- Alignment with Zaragoza's Sustainable Urban Logistics Plan (SULP):
- The pilot operates entirely within Zaragoza's new LEZ, testing zero-emission freight delivery models.
- Uses the Central Market as a shared consolidation hub, a model SULP identifies as key for efficient, sustainable last-mile distribution.
- Pilot enforces data sharing and joint operations between carriers, retailers, customers and local administration.
- Provides evidence base for future policies such as access time restrictions, eco-delivery incentives, and differentiated pricing by emissions or delivery type.

3.2.6 Operational requirements

The markets themselves are used as logistics centers. There, staff prepare the orders, and the delivery company picks them up and makes the deliveries.

Once the delivery company picks up the product at the market, deliveries are immediate since it's fresh produce.

The actual delivery and specific destinations can be monitored on the Mercadeando platform.

The Zaragoza pilot requires an integrated infrastructure + digital + governance ecosystem:

1. A shared urban hub within the LEZ,
2. A data-driven routing and gamification system,
3. Cross-operator agreements under city leadership, and

4. Policy alignment with LEZ, SUMP, and SULP frameworks.

Meeting these operational requirements ensures that the pilot can transition from a small-scale demonstrator to a scalable, permanent green logistics solution for Zaragoza.

Physical & Infrastructure Requirements:

Micro-hub facility: A secure, accessible space for parcel transfer and temporary storage. In the pilot, this is the Central Market, provided by the Market Authority of Zaragoza City Council.

Loading/unloading bays: Dedicated, time-restricted zones for electric vans and cargo bikes to access the hub without disrupting pedestrian flow. Provided by City Mobility Dept.

Requirements:

Agreements defining data sharing, hub access and scheduling rules between City Council and Operators.

Technical & Operational Performance Requirements:

Emission reduction (≥ 30% CO_2 reduction vs. baseline), vehicle utilization (≥ 80% average load factor) and Energy efficiency (100% electric or hybrid last-mile fleet).

3.2.7 Implementation steps and processes

The implementation of the Zaragoza Pilot/Green Button follows a structured approach designed to ensure the successful deployment of a sustainable urban logistics system within the city. This approach encompasses several key stages: definition and planning, pilot design, implementation of the pilot, and pilot evaluation. Each phase is critical to achieving the overarching goals of reducing emissions, improving logistics efficiency, and promoting accessibility. The process emphasizes continuous monitoring, adaptation, and collaboration among all stakeholders to create a replicable model for greener and more equitable urban deliveries.

1. **Definition and planning** to understand the local context, needs, barriers, and opportunities before designing the pilot.

   The implementation of the Green Button pilot begins with an initial phase of definition and planning, where the project's objectives are clearly established. These objectives focus on promoting more sustainable, efficient, and inclusive urban logistics. During this phase, key stakeholders are identified, including the City Council, logistics operators, local businesses, citizen associations, and consumers. Additionally, key performance indicators (KPIs) and metrics are defined to measure the pilot's environmental, economic, and social impacts.

2. **Pilot design**: in this phase, the operational model of the pilot is designed. This involves:

- Define the pilot implementation area, which will be carried out in three municipal markets: Agroecological Market, Central Market, and Valdespartera Market.
- Decide on delivery methods: deliveries will be made on foot for the closest deliveries and by electric vehicles.
- Model optimized routes to minimize distance traveled and pollutant emissions.
- Plan mechanisms for monitoring and evaluating environmental indicators, mobility, economic indicators, and satisfaction indicators.

3. **Implementation of the pilot**. This involves:

- Establish clean/zero-emission pilot fleets for deliveries.
- Involve selected retailers, logistics operators, and end users.
- Monitor performance in real time: delivery times, actual emissions, space occupancy, congestion, and merchant/customer feedback.
- Adjust operations (schedules, routes, delivery points) based on the data collected.
- **Pilot evaluation** and proposals for improvements.

After implementing the pilot, an evaluation of the results is conducted, which includes:

- Evaluate results using defined KPIs.
- Conduct economic analysis: operating costs versus environmental and social benefits.
- Identify regulatory, technical, and citizen acceptance barriers.
- Co-creation sessions/workshops with stakeholders to gather improvement proposals.
- Integrate learnings and refine the operational, technological, and regulatory design.

Finally, based on the insights and results obtained, areas for improvement are identified, and processes and technologies are adjusted accordingly. The project can then be redesigned or expanded to other areas or sectors of the city, aiming to ensure the long-term sustainability of the model.

3.2.8 Testing and validation approach

After considering different companies and delivery methods, the final delivery companies are Koiki and La Veloz (in partnership with Atades), using bicycles, electric bicycles, or on foot. In all cases, the containers are thermally insulated.

To optimize routes, implementing staggered or multiple delivery methods is being considered. This will require developments and changes to the Mercadeando web application.

Similarly, it may involve some changes or adaptations in the operations of the staff working at the logistics center and the retailers.

Therefore, it is estimated that all of this positively affects the three groups of KPIs considered (environmental, economic and social).

3.2.9 Expected challenges and risk mitigation

The Zaragoza pilot/Green Button faces operational and governance challenges. Integrates several innovations like shared micro-hubs, electric fleets, social incentives, and data sharing.

These innovations create value but also introduce operational, technical, social, and policy risks that must be managed throughout deployment.

Risks involve coordination between stakeholders.

1. **Operational and capacity risks (hub space, peak load management)**

These risks are related to the infrastructure and operational capacity to implement the sustainable last-mile delivery project in Zaragoza. They include physical factors like hub space, vehicle capacity, and efficient demand management.

Expected: limited hub space in market facilities, insufficient for peak volumes.

Hub space in market facilities could be very limited, which could affect the ability to store and manage products that need to be delivered. Additionally, seasonal fluctuations or demand spikes could overwhelm the operational capacity of the delivery network.

Mitigation: demand forecasting, use of supplementary hub during peak demand.

Exploring the possibility of using supplementary depots, as well as flexible route and vehicle planning to adapt to demand variations, could help reduce congestion and optimize delivery routes.

2. **Data / digital risks (cybersecurity, data sharing across partners)**

This category covers risks related to data security, information sharing among project stakeholders (partners, LSPs, local authorities, etc.), and the protection of personal data.

Expected: cybersecurity and data protection risks.

The security of the systems managing data is crucial. If the systems used for route monitoring or user information are not well protected, they could be vulnerable to cyberattacks, compromising the integrity of the data.

Furthermore, data needs to be shared among stakeholders (local authorities, LSPs, retailers, etc.), which introduces risks of interoperability, transmission errors, or improper data handling.

Mitigation: use of encrypted communications and pseudonymized data, external audits.

Implementing robust cybersecurity protocols, such as data encryption, and authentication measures to prevent unauthorized access. Compliance with European and Spanish regulations such as GDPR (General Data Protection Regulation) is also essential.

Establishing clear agreements on data exchange protocols, ensuring system interoperability and transparency in data usage.

3. Social / behavioral risks (citizen uptake, merchant uptake, perception of new delivery model)

Social risks are those related to community acceptance of the project, citizen participation, and adaptation to new consumption or transport behaviors.

Expected: low citizen uptake of Green Button / sustainable options.

Citizen engagement is key to the success of sustainable delivery projects, but there is a risk that citizens may not sufficiently engage with or adopt this new system. Also, the change in delivery models, the use of electric vehicles or bicycles, or the adoption of new delivery methods could meet resistance from both retailers and consumers.

Mitigation: incentive campaigns (points, discounts); integrate with popular local apps.

Awareness and education campaigns on the benefits of sustainable delivery, information campaigns to involve the community, and facilitate the transition to the new system. Offering incentives such as discounts or additional benefits could also increase participation.

4. Regulatory / governance risks (timing of LEZ measures, public acceptance of restrictions)

These risks are linked to the legal, regulatory, and administrative aspects of implementing the project.

Expected: Possible delays in the implementation of the municipal LEZ.

Low Emission Zones are crucial for reducing pollution, but any delays in their implementation or adherence to deadlines could jeopardize the project's viability.

Mitigation: coordination with LEZ enforcement teams; flexible pilot timeline. Ongoing collaboration with local authorities to ensure deadlines for the ZBE are met, as well as including contingency plans to adapt to potential delays.

Expected: seasonal demand fluctuations.

Mitigation: adaptive scheduling, temporary hubs, contingency fleet.

Expected: public discontent with new traffic regulations or the implementation of LEZs.

The implementation of new environmental regulations, such as the LEZ, may generate discontent among citizens, especially those directly affected by restrictions on traditional vehicle use.

Mitigation: transparent communication, participatory design, citizen co-creation workshops.

Information campaigns on the health and environmental benefits of the LEZ. Ensuring that policies are inclusive, for example by offering alternative public transport options and efficient delivery systems that mitigate the perceived negative effects of the LEZ.

3.3 Vienna pilot/ LogPoint

This section presents the Vienna pilot project entitled LogPoint in detail, outlining the conceptual framework and operational structure of its implementation. The chapter begins with a description of the objectives, scope and structure of the pilot project, followed by an analysis of the alternative scenarios considered and the reasons for selecting the most sustainable configuration. It then discusses the alignment of the pilot project with Vienna's strategic mobility and logistics policies, together with the definition of operational requirements, implementation steps. The section concludes with a rough overview of the testing and validation procedures, as well as the challenges to be expected and corresponding strategies for overcoming them, which will ensure reliable execution and long-term scalability of the LogPoint model.

3.3.1 Description of the pilot

General description

LogPoint is a full-service intralogistics fulfilment provider, offering multiple modules for a tailor-made package for e-commerce businesses. LogPoint will implement a marketplace pilot in Vienna, Austria, where it operates a City Logistics Hub that guarantees short and efficient links for cargo bikes and electric vehicles (see Table 15). The company offers sustainable solutions, including zero emission delivery options, as well as optimized returns management that allow multiple cycles for (re)using packaging materials. The company business model includes 90% B2C and 10% B2B. 98% of all deliveries are parcels, with a majority of foods and beverages (92%), as well as pharmaceuticals and cosmetics (6%), and home furnishings (2%).

LogPoint aims to enhance the sustainability and financial viability of its operations by pursuing changes in its packaging and transport processes.

Table 15. Overview of the LogPoint Pilot

Basic information	Description
Title of the Pilot	LogPoint
Region – Country	Vienna - Austria
Participants	LogPoint (Logistics Service Provider-Warehousing), Veloce (Logistics Service Provider-Transport), LaVialla (Business Client), Econsult Betriebsberatung, potential rollout partner: Biobalkan (Business Client),
Type of pilot	Business-to-Business (B2B), Business-to-Consumer (B2C)
Short description	Create a carbon-free food logistics model integrating elements of circular economy aspects.

Overview and Strategic Context of the LogPoint Pilot

The LogPoint pilot in Vienna represents a practical model for integrating circular economy principles into e-commerce fulfilment and urban logistics. Building on its existing infrastructure and service portfolio, LogPoint aims to demonstrate how packaging reuse, on-site material recycling and zero-emission delivery can be operationally combined within a single, scalable framework. The initiative targets the reduction of both packaging waste and delivery-related emissions, thereby directly contributing to the decarbonization of urban logistics processes.

Unlike conventional parcel networks that rely on long distribution chains and multiple handling points, the LogPoint pilot follows a short-loop logistics concept centered on the company's City Hub in Vienna. Deliveries are consolidated locally and distributed via fully electric e-scooters operated by the partner company Veloce. This configuration minimizes vehicle kilometers travelled (VKT) while ensuring real CO_2 avoidance instead of offsetting. At the same time, the on-site carton recycling process closes the material loop within the fulfilment center by transforming returned or inbound packaging into recycled filler for outbound shipments.

The pilot is aligned with Vienna's broader strategic goals for sustainable urban logistics and the promotion of e-mobility in commercial transport. The LogPoint pilot directly supports these policy directions and provides empirical evidence for future regulatory and planning frameworks.

Spatial description

The LogPoint pilot is implemented within the metropolitan area of Vienna. The fulfilment hub is located in the industrial zone on the city's western periphery, ensuring direct access to Vienna's main arterial roads and short transfer distances to the inner-city delivery zones. This central positioning allows for efficient bundling of orders and facilitates the deployment of zero-emission micro-vehicles for last-mile distribution (see Figure 9).

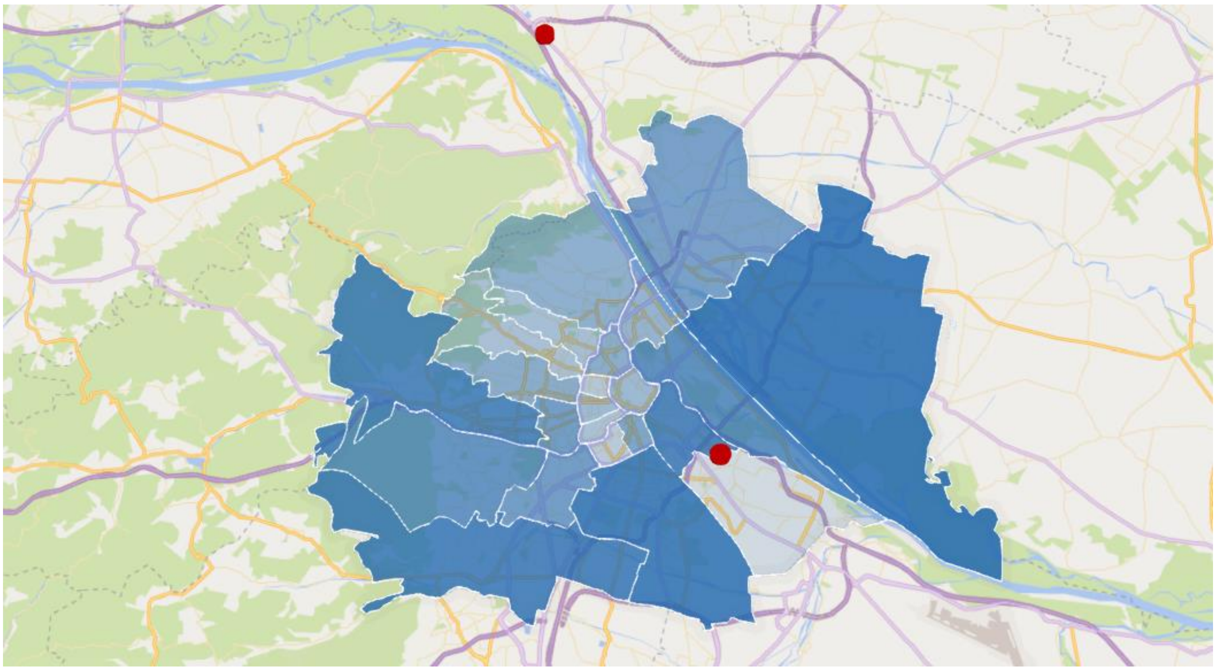

Figure 9. Delivery Area LogPoint Pilot (delivery via Veloce)

The delivery routes are defined and coordinated by the transport partner Veloce, which integrates the pilot deliveries into its wider network of urban distribution activities. By operating within existing delivery territories and using e-scooters on short, optimized circuits, the pilot contributes to lowering local emissions and noise levels while maintaining flexible, customer-oriented service coverage throughout the city.

3.3.2 Main elements of the LogPoint Pilot

This section describes the key operational and environmental elements that form the basis of the LogPoint pilot project. The pilot project is based on five interlinked pillars: circular packaging and material reuse, zero-emission urban delivery, digital integration and traceability, space and process planning, and organizational flexibility and collaboration.

Together, these elements form a coherent framework that combines sustainable packaging management with CO2-free last-mile distribution. The transition requires reorganized on-site processes, adjustments to systems, and close coordination between fulfilment, transport, and customer interfaces. The result is an adaptable, data-driven and resource-efficient model for urban e-commerce logistics.

1. Circular Packaging and Material Reuse

This pillar focuses on establishing a closed packaging loop within the fulfilment hub. The process introduces a new operational layer that requires systematic handling, separation and documentation of recyclable materials and impacts internal logistics and waste disposal procedures (see Figure 10).

Figure 10. Carton shredder machine (Source: Transpak AG (https://www.transpak.de/kartonschredder-cushion-pack-316-s3i-standgeraet))

2. Zero-Emission Urban Delivery

The delivery concept replaces conventional parcel transport with fully electric micro-vehicles (see Figure 11) that travel on optimized routes and within defined delivery time windows. This change requires special route planning and coordination between the fulfilment hub and urban distribution areas.

Figure 11. eScooter Source: Veloce (https://veloce.at/cargoscooter/)

3. Digital Integration and Traceability

To accommodate new material flows and delivery patterns, the pilot project introduces enhanced monitoring of data and data exchange between warehousing, packaging and transport systems. This integration enables transparent tracking of environmental and operational performance indicators and supports continuous optimization.

4. Space and Process Planning

The transition from national parcel networks to locally coordinated emission-free distribution requires new considerations regarding space utilization. Consolidation points, storage areas and charging infrastructure must be arranged in such a way as to ensure efficient connections between the fulfilment hub and inner-city delivery zones.

5. Organizational Flexibility and Collaboration

The introduction of new processing steps and delivery methods leads to greater interdependence between operational players. A well-coordinated organizational framework ensures smooth interaction between fulfilment, transport partners and customers, while supporting scalability and replicability in other urban contexts.

3.3.3 Description and evaluation of pilot scenarios

Following the methodology for creating a minimum viable product, the evaluation criteria defined for the project were analyzed for the Austrian pilot and those that were not relevant to the use case were excluded in the first step. The remaining criteria were discussed, and ultimately three criteria were used for the evaluation process in question:

- Environmental impact: The focus is on achieving actual CO_2 reductions without resorting to offsets. This aspect can be assessed in all scenarios.

- Operational feasibility: Here, the feasibility is analyzed in detail and checked for long-term feasibility in order to determine profitability over a longer period of time.

- Economic viability: The goal of this project is to serve as a basis for continuation and potential expansion beyond its initial implementation. To ensure that activities can be sustained after the project's completion, this criterion is particularly important.

Based on these three evaluation criteria, all scenarios were assessed:

Scenario 1: Current status

LogPoint operates warehouse logistics for various retailers at one location. The products are stored on shelves or pallets, picked using different systems depending on the product and the shipping type, packed into new boxes, and then a shipping label is created. Currently, almost 100% of shipments are handled by Austrian Post, with the exception of pallet shipments. The parcels are sorted into postal containers and sorted into postal swap containers. The containers are being transported to the nearby parcel distribution centers several times a day. This scenario reflects the current operating model, and Table 16 summarizes its evaluation.

Table 16. Evaluation of Scenario 1

Evaluation Criteria	Score (1–5)*	Justification
Environmental impact	1	CO^2 neutral not CO^2 free
Operational feasibility	3	Status quo
Economic viability	3	Status quo

Scenario 2: Urban ZE Food Deliveries

At present, customer food orders are stored, picked, and packed in the fulfillment hub and then handed over to the Austrian Post for distribution. The Austrian Post already operates a large share of zero-emission delivery vehicles, ensuring that most shipments are carried out without direct CO_2 emissions. For those remaining routes where conventional vehicles are still in use, the resulting emissions are financially compensated to maintain overall CO_2-neutral delivery performance. While this approach achieves climate neutrality in balance, it still leaves room for further improvement through direct emission reduction and increased resource efficiency within the fulfillment process itself.

In the future, these parcels will no longer be sent individually through the Austrian Post's parcel network. Instead, all orders destined for Vienna will be bundled and routed together to a local consolidation point in the city. From there, the shipments will be re-sorted and delivered to end customers using e-scooters, operated under optimized delivery routes and time windows.

This approach enables real emission avoidance instead of compensation and introduces a fully carbon-free last-mile solution for food logistics. By integrating urban consolidation, route optimization, and zero-emission micro-mobility, the model significantly reduces the environmental footprint of e-commerce deliveries while maintaining high service.

The scenario illustrates how local consolidation and lightweight electric transport can replace compensated parcel deliveries with actual CO_2 reductions, offering a replicable blueprint for sustainable urban food distribution in metropolitan areas. Table 17 summarizes the evaluation of Scenario 2 across environmental impact, operational feasibility and economic viability

Table 17. Evaluation of Scenario 2

Evaluation Criteria	Score (1–5)*	Justification
Environmental impact	2	An improvement from CO^2 neutral to CO^2 free
Operational feasibility	2	Operationally feasible, additional effort for cubature evaluation

Economic viability	1	Costs must be borne by customers, especially at the last mile.

Scenario 3: On-site Carton recycling

In the daily operations of the fulfillment hub, several cubic meters of carton boxes are received each day, originating from customer returns or inbound product deliveries. Until now, these materials were either disposed of as waste or manually sorted for limited reuse. This practice generated both high waste management costs and an increasing need to purchase new, commercially available filling and cushioning materials for outbound shipments.

To address this inefficiency, LogPoint will integrate a carton recycling system into its operations. The initiative involves the acquisition and installation of a carton shredder machine that processes used carton boxes directly on-site into reusable filling materials. These shredded materials replace externally purchased fillers, thereby establishing a closed-loop packaging process within the hub.

The solution represents a practical example of circular logistics, where existing waste streams are transformed into valuable resources. The recycling of carton boxes not only decreases disposal volumes and related waste fees but also reduces the environmental footprint of the fulfillment process by minimizing the need for virgin packaging materials and preventing unnecessary CO_2 emissions associated with their production and transport (see Table 18).

Table 18. Evaluation of Scenario 3

Evaluation Criteria	Score (1-5)*	Justification
Environmental impact	3	Reduction of packaging waste is expected
Operational feasibility	3	Production is easy to integrate into the workflow
Economic viability	3	No negative "side effects"

Scenario 4: Green Fulfillment

This scenario represents a combined configuration that merges the key elements of two previously analyzed approaches: (a) on-site recycling of used carton boxes into filler material and (b) direct zero-emission food deliveries within Vienna. The aim is to integrate both measures into one operational workflow, reducing emissions and packaging waste simultaneously.

In the current situation, products are packed in new carton boxes and filled with externally purchased filling material before being handed over to the Austrian Post for delivery. Although the Austrian Post already operates many zero-emission vehicles, part of its climate neutrality is achieved through compensation payments. At the same time, used cartons from inbound goods and customer returns are mostly discarded instead of being reused.

The combined scenario modifies two steps of this process. First, used carton boxes generated in the fulfilment hub are collected separately, shredded on-site, and reused as filling material for new outbound shipments. This establishes an internal circular flow of packaging materials and decreases the need for purchasing virgin paper fillers. Second, parcels destined for customers in Vienna are no longer handed over to the Austrian Post. Instead, they are grouped and routed directly to the local delivery partner Veloce, which distributes them using electric scooters. Deliveries are organized according to predefined time windows and optimized routes.

These changes shorten the overall transport chain, reduce handling steps, and ensure that deliveries within Vienna are carried out entirely without direct CO_2 emissions. At the same time, the recycling process within the warehouse lowers material input and waste volumes, resulting in measurable environmental improvements on both the packaging and transport side.

Operationally, the integration of both measures requires adjustments to internal workflows: separate collection and storage areas for recyclable cartons, coordination between shredding and packing lines, and allocation of parcels suitable for e-scooter delivery according to product type and weight. The coordination with the transport partner replaces the previous handover to the national parcel network, introducing direct data exchange for shipment registration and tracking.

Economically, the scenario is expected to reduce procurement and disposal costs for packaging materials and to lower delivery costs for urban destinations, while maintaining flexibility to revert to conventional shipping for non-suitable products (Table 19).

Table 19. Evaluation of Scenario 4

Evaluation Criteria	Score (1–5)*	Justification
Environmental impact	4	The highest possible reduction in emissions is the combination of zero-emission last-mile deliveries and on-site carton reuse as filling material
Operational feasibility	4	Due to delivery by e-scooter, the use of reused packaging material is very possible
Economic viability	5	The highest savings not only in terms of CO2 but also in terms of costs

Comparative evaluation and selection of the best scenario

To capture the comparative performance of the evaluated scenarios, the following table summarizes their respective scores across key assessment dimensions – environmental impact, operational feasibility, and economic viability. This consolidated view highlights the relative strengths of each configuration and provides an analytical basis for selecting the most balanced and sustainable option for implementation within the LogPoint pilot (see Table 20).

Table 20. Comparative scenario scores across evaluation criteria

Scenario	Environmental impact	Operational feasibility	Economic viability	Total Score
Current status	1	3	3	7
Urban ZE Food Deliveries	2	2	1	5
On-site Carton Recycling	3	3	3	9
Green Fulfillment	4	4	5	13

To support the evaluation and final selection of the most suitable configuration for the LogPoint pilot, the following table summarizes the main characteristics, advantages, and limitations of the three alternative scenarios. The comparison highlights how each approach contributes differently to environmental performance, operational feasibility, and economic efficiency. By presenting these aspects side by side, Table 21 provides a clear basis for identifying the scenario that delivers the highest overall sustainability impact and practical applicability within Vienna's urban food logistics context.

Table 21. Comparative evaluation of pilot scenarios – strengths, limitations and selection rationale

Scenario	Description	Strengths	Limitations
Current status	Packaging material is 100% bought, Austrian Post delivers	• Well-rehearsed process • Economically feasible • No additional process steps or conversions necessary	• CO^2 reduction is not possible
Urban ZE Food Deliveries	Use of e-scooters for ZE last mile food distribution in urban areas	• Achieves real emission avoidance instead of financial compensation. • Enables carbon-free, quiet, and efficient last-mile operations.	• Requires new delivery coordination and infrastructure. • Higher organizational effort for route planning and consolidation.

		• Supports local sustainability goals and urban air-quality improvement.	• Additional costs for setup and e-scooter fleet management.
On-site Carton Recycling	Recycling of Used Shipping Boxes into Sustainable Packaging Material	• Establishes a circular material flow within the hub. • Reduces packaging waste and disposal costs. • Avoids emissions from production and transport of virgin packaging materials. • Low investment and easy integration into daily workflow.	• Requires additional workspace and process coordination. • Limited applicability depending on product type and hygiene requirements. • Increases internal handling and monitoring tasks.
Green Fulfillment – Sustainable Packaging and Zero-Emission Food Deliveries	Sustainable Packaging combined with Zero-Emission Food Deliveries	• Maximizes environmental benefit by combining waste prevention and emission-free transport. • Reduces both operational costs and carbon footprint. • Highly replicable model for sustainable e-commerce logistics. • Strengthens cooperation across fulfillment, transport, and clients.	• Requires synchronized process management and IT adaptation. • Higher initial coordination effort for partners and systems. • Performance depends on customer participation and product suitability.

3.3.4 Description of most promising pilot scenario

Based on the information assessment and scenario evaluation conducted in the previous sections, the following table presents in a nutshell the most promising pilot scenario for the Vienna pilot. Table 22 summarizes the key identifying details for reference throughout the subsequent operational analysis.

Table 22. Vienna Pilot (LogPoint) Identification

Pilot's ID	
Pilot's ID	GreenTurn-VIE-LP-101147942
Title of the Pilot	LogPoint
Description	Circular and zero-emission urban logistics pilot combining on-site recycling of cardboard packaging

	materials with e-scooter deliveries for food and beverage orders in Vienna, Austria.
Mode of transportation	e-scooter
Spatial information	Vienna, Austria
Information technology	-
Parameters tested	Packaging material reuse, On-site carton shredding and recycling, Integration of recycled fillers into packing process, Zero-emission last-mile delivery via e-scooters.

As a result of the preceding analysis and evaluation, the pilot project should be based on scenario 4.

The following chart (see Figure 12) outlines the standard fulfilment process. The implemented measures will significantly improve the final two steps with regard to emission performance.

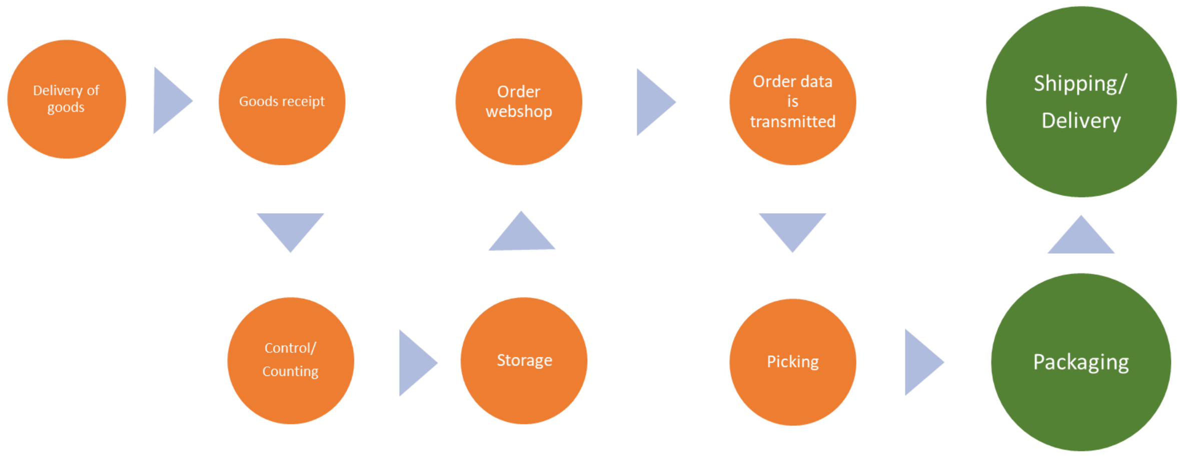

Figure 12. LogPoint warehouse process

The following section provides a detailed description of the individual process steps.

Packing

Preparations in the warehouse

Carton waste is generated at several points within the warehouse:

- Carton packaging arrives in the goods receiving area in the form of outer packaging. Once the inbounded products are unpacked for storage, the carton boxes are being disposed.
- The second scenario is returns. Incoming products packed in shipping cartons are unpacked and stored again or returned to suppliers. Currently, these carton boxes are collected in a container in the warehouse.

To enable recycling, separate containers must be installed for "recyclable" and "non-recyclable" materials. The recyclable materials collected in this way are brought to the shredder machine by the forklift drivers. There, an employee operates the machine and inserts the cartridges. At the end of the process, a pallet mesh box is filled with shredded material. These are then distributed by the forklift driver to the pick & pack stations.

As before, the materials to be disposed of will be collected in a separate container and collected by the disposal company.

To obtain valid data, the weight of the carton boxes that are recycled and those that are discarded is measured. The observation period is one month, after which this data is used for extrapolation based on the total volume of carton packaging.

Data control

As part of the pilot, it will be assessed which products are suitable for the new recycled filler material and for which it may be less appropriate. The synergy between the two pilot components results from the modified delivery solution, which already requires less packaging material. In the alternative delivery process, parcels are not handled through distribution centers or conveyor belts but are loaded directly into the vehicles. Consequently, less additional securing with filler material is required during transport.

In the future, it will be necessary to identify in advance which customers, products, or parcel types are compatible with this packaging method. Ideally, these shipments will also be delivered by e-scooter. Initially, this selection can only be carried out manually. However, the goal is to develop an automated decision system that assigns suitable products directly to the appropriate packaging line.

Communication

The goal is to begin with one test customer (retailer) and subsequently extend the service to additional retailers. As the measure is beneficial both ecologically and economically, no major obstacles are expected, provided that product characteristics allow its application. The concept is therefore easily scalable and can also be transferred to other countries.

For end customers, targeted communication measures are envisaged to enhance awareness and acceptance of the solution. An active selection option for customers is not planned, since the applicability of the recycled filler depends on product quality and packaging requirements.

<u>Delivery</u>

Process

Currently, almost all parcels with parcel shipping are sent by Austrian Post. Austrian Post assures that deliveries are Co2 neutral but not Co2 free.

Products from different customers are packed at various pick & pack stations within the warehouse. At all pick & pack stations, parcels are placed into containers and subsequently transferred to postal swap bodies. To ensure that the products reach the end consumer undamaged, they are mainly secured with filling paper, depending on the product type. The consumption of filling paper in this process is currently very high.

In the project, it will be evaluated which products

- can be packed with alternative filling material from the shredder and then remain in the normal process

- can be packed with alternative filling material from the shredder and handed over to Veloce for delivery by e-scooter.

For alternative delivery, separate pallets/containers are provided at the packaging lines. So, the products will already go their separate ways from the pick & pack station.

Data control

Based on the number of parcels and customer postcodes, it is possible to accurately identify which shipments were delivered using the alternative method. Veloce will provide corresponding delivery data for evaluation. The target is to reach a share of at least 20% of all deliveries per participating retailer.

Communication

Prior to the start of the project, discussions were held with retailers —particularly Fattoria La Vialla — regarding their potential participation. As a result, the first major project partner has already been confirmed. However, the intention is to extend this delivery option to additional retailers. Owing to the synergy effects and the fact that the approach can be economically viable starting from as few as two parcels per customer, further interest is expected.

Data analysis and process improvement

With ECONSULT, LogPoint has an experienced partner for evaluation and analysis. Together, both partners will assess the project data and identify potential optimization. Given the low initial investment, no significant risks are anticipated; however, clear communication and customer acceptance will be crucial for success. The initiative is expected to generate both economic and ecological benefits.

3.3.5 Alignment of pilot with local SUMPs/SULPs

Vienna does not currently have a SULP, but papers that address the issues of mobility and urban development exist. Two of these strategy papers[1] were analyzed and presented as part of the Greenturn project (see Figure 13).

[1] Vienna City Administration, 2014. STEP 2025 - Urban Development Plan Vienna. Vienna: Vienna City Administration, Municipal Department 18 (MA18) Urban Development and Planning (Vienna City Administration, 2014) and

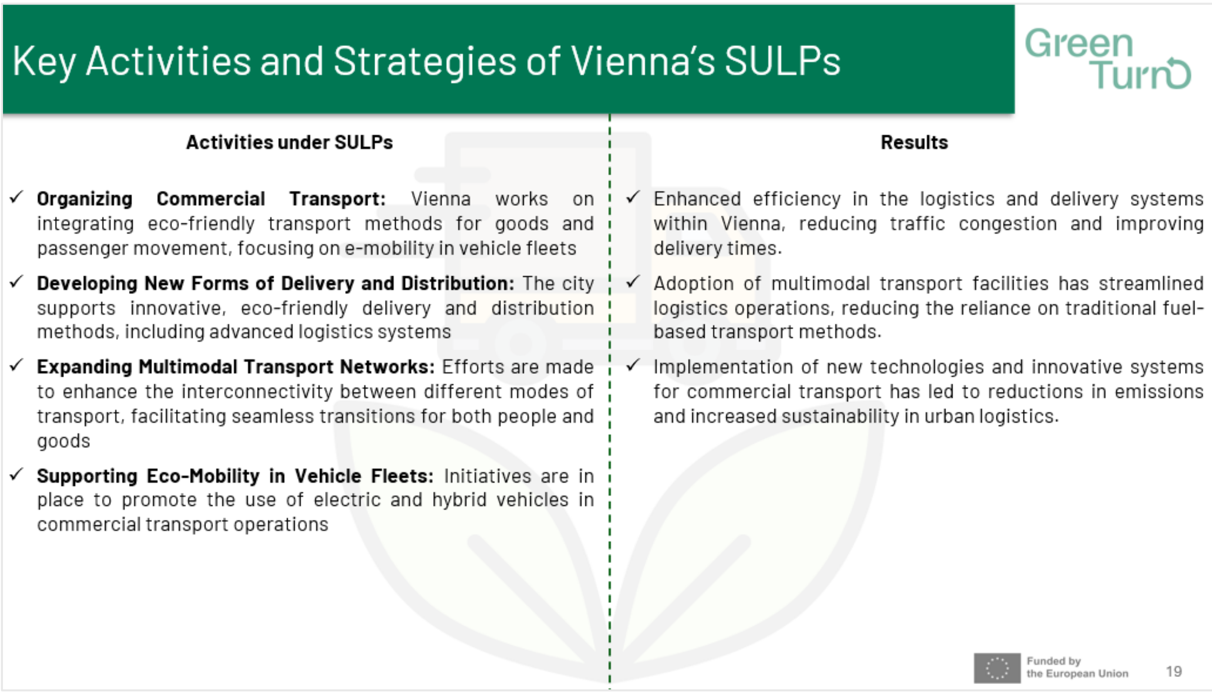

Figure 13. Logistics strategies identified in official strategy papers

The following activities were identified:

Organizing Commercial Transport: Vienna works on integrating eco-friendly transport methods for goods and passenger movement, focusing on e-mobility in vehicle fleets

The Vienna pilot directly supports this strategic objective by demonstrating how e-mobility can be effectively integrated into commercial goods transport through zero-emission last-mile deliveries operated by electric micro-vehicles within the city.

Developing New Forms of Delivery and Distribution: The city supports innovative, eco-friendly delivery and distribution methods, including advanced logistics systems

By testing an integrated approach that links on-site material reuse with zero-emission delivery and digitally coordinated logistics, the pilot exemplifies how innovative and eco-friendly distribution methods can be realized in urban practice.

Expanding Multimodal Transport Networks: Efforts are made to enhance the interconnectivity between different modes of transport, facilitating seamless transitions for both people and goods.

Through the integration of zero-emission micro-mobility solutions into existing logistics chains, the pilot strengthens the interconnection between transport modes and enables seamless transitions from regional distribution to urban last-mile delivery.

Telepak, G., Magistrat der Stadt Wien (Eds.), 2015. Urban mobility plan Vienna: together on the move: thematic concept, Werkstattberichte. Vienna City Administration, Municipal Dep. 18 (MA 18) - Urban Development and Planning, Vienna.

Supporting Eco-Mobility in Vehicle Fleets: Initiatives are in place to promote the use of electric and hybrid vehicles in commercial transport operations.

Building on the use of electric micro-vehicles for last-mile distribution, the pilot drives the transition toward eco-mobility in commercial transport and proves the viability of emission-free fleet operations in the urban context.

3.3.6 Operational requirements

Operational Timelines and Milestones

- **Preparatory Phase:**

The preparatory phase constitutes the initial stage of the Vienna LogPoint pilot and ensures that all technical, organizational, and logistical prerequisites are established before the start of live operations. During this period, the focus lies on setting up the internal recycling process for carton packaging materials and preparing the transition toward zero-emission deliveries in cooperation with the transport partner.

Filling material

Several preparatory measures are being carried out on the implementation side. Collection containers for separating recyclable and non-recyclable cartons are being procured and set up. The internal room layout is being adapted to the new recycling workflow, including defined collection points and a designated area for shredding. The cardboard shredder will be procured and put into operation, and employees will be trained in the operation of the machine, safety precautions and sorting requirements. At the same time, in consultation with pilot customers, it will be determined which products are suitable for packaging with the new recycled filling material. Initial test deliveries will then be prepared and evaluated to check the functional and protective quality of the shredded filling material.

In addition, the framework for data collection will be defined. Possible parameters could include the number and weight of recycled versus discarded cartons, the proportion of recycled filling material used in outgoing shipments, or the comparable amount of residual waste relative to the previous year. Standardized data collection forms will be created to ensure consistent monitoring and subsequent extrapolation of results.

Transport

On the transport side, LogPoint and Veloce jointly plan the new delivery configuration, including route frequencies, shipping volumes and operational time slots. In this phase, data is still exchanged manually via CSV files provided by LogPoint. Veloce uses this information to contact end customers and allow them to select delivery time slots. The daily delivery reports are then sent back to LogPoint for data consolidation. As part of the pilot project, postcode-based recording of deliveries will be introduced to quantify emission savings. In the first implementation phase, this registration will be carried out manually by LogPoint and will subsequently be automated once stable processes have been achieved.

- **Pilot Launch:**

Following the preparatory phase, the Vienna LogPoint pilot will enter its operational stage. At this point, the carton-shredding system is fully integrated into the fulfilment workflow, and the zero-emission delivery network operated by Veloce is ready to commence daily operations.

Initial activities will focus on live testing of the two interconnected workstreams: (a) the production and utilization of recycled carton filler within regular packing processes and (b) the execution of zero emission last-mile food deliveries to selected Vienna districts.

LogPoint's fulfilment team will ensure continuous supply of recycled filler at all pick & pack stations. In parallel, Veloce will perform e-scooter deliveries within the specified delivery time.

During the first operational weeks, emphasis will be placed on verifying workflow stability, documenting indicators, and addressing potential technical or organizational issues immediately. Early feedback from retailers and staff will support the refinement of processes before the full-scale rollout across additional clients.

- **Continuous Monitoring and Midterm Review**

Throughout the pilot implementation, LogPoint will conduct systematic monitoring of operational, environmental, and economic indicators. Data streams will be collected through warehouse records, delivery logs, and Veloce's digital tracking systems, covering metrics such as:

- number and weight of recycled versus disposed cardboard boxes,
- share of deliveries executed via zero-emission vehicles,
- etc.

Monthly reviews will track progress against targets, enabling corrective actions whenever deviations occur. Midway through the one-year observation period, a structured midterm review will be organized with all involved partners, including Fattoria La Vialla and other pilot retailers.

This review will evaluate the effectiveness of packaging reuse, identify process bottlenecks, and assess the market acceptance of the new delivery model. Adjustments may include refining filler allocation by product category or optimizing delivery districts. The outcome of the review will determine the parameters for the second half of the pilot to ensure consistent quality, cost efficiency, and environmental performance.

- **Final Evaluation and Reporting**

At the end of the pilot period, all collected operational and environmental data will be consolidated and analyzed. The final evaluation will assess the overall performance in three key dimensions:

Environmental: quantification of avoided CO_2 emissions and reduction in packaging waste;

Economic: cost savings from filler reuse and efficiency gains in delivery operations;

Operational and social: service reliability and information of clients.

The changes will become visible through the measurement and analysis of key figures during the pilot phase.

Roles and responsibilities

The Vienna pilot builds on close operational coordination between all involved partners to achieve a seamless connection between fulfilment, packaging reuse, and zero-emission last-mile delivery. Each organization contributes specific expertise and responsibilities within this integrated setup, ensuring that daily logistics processes run efficiently, environmental targets are met, and the pilot can evolve dynamically based on real-world experience.

LogPoint Vienna, as the central logistics hub operator, is responsible for managing all day-to-day fulfilment and consolidation activities. This includes the operation of the carton-shredding system, production and storage of recycled fillers, order preparation, packaging, and coordination of outbound shipments to Vienna delivery zones. LogPoint also maintains the local warehouse infrastructure, oversees occupational safety and compliance with waste-handling regulations, and records data for evaluation purposes. It also supports staff training and data validation, ensuring the reliability of operational and environmental indicators generated during the pilot.

Veloce, the zero-emission delivery partner, performs the final distribution to end customers using its fleet of electric scooters. Veloce manages vehicle operation, charging logistics, and route execution in accordance with the delivery manifests prepared at LogPoint Vienna. The company is also responsible for real-time tracking, proof of delivery, and the return of packaging materials collected during reverse-logistics rounds.

In the first step, LogPoint's customer Fattoria La Vialla will decide which orders will be delivered with e-mobility. It evaluates the delivery districts, the weights, and sizes of the shipments.

Depending on the development of the pilot, in the second step, customers might get the possibility to actively select one of the two options.

Workflow for Deliveries and Returns

Packages suitable for delivery by e-scooter are identified directly during the packaging process and forwarded to a designated loading area within the warehouse. Fulfillment employees prepare the shipments with recycled filling material, secure them in reusable packaging, and then load them into marked roll containers. Internal logistics coordination ensures that cardboard shredding, filling material distribution and packaging lines work in sync, so that recycled material is continuously available without disrupting the workflow. Forklift drivers transport the filled containers to the goods issue area, where they are sorted by delivery district and time slot. Veloce picks up the shipments according to a predefined schedule, consolidates the orders by zone and makes the deliveries using electric scooters on optimized city routes. Confirmation of deliveries and feedback to LogPoint provides a complete record of daily operations and enables continuous performance evaluation.

Monitoring and Data Collection

Continuous monitoring accompanies all operational steps to ensure transparent tracking of environmental and logistical performance. LogPoint records key figures on recycled versus disposed cartons, the share of parcels delivered by zero-emission vehicles, and filler usage ratios. Veloce contributes delivery data, including transport information which is consolidated by LogPoint for analysis. Data entry templates and regular checks guarantee consistency between warehouse and transport records. The combined dataset provides the basis for evaluating emission avoidance, cost savings, and workflow efficiency. Summaries are reviewed jointly by LogPoint, Veloce, and Econsult to identify potential for improvement and maintain alignment with pilot objectives.

Risk Management and Contingency Planning

The LogPoint pilot applies a practical risk management approach to ensure stable daily operations and quick recovery from potential disruptions. Regular maintenance of the carton shredder and inspection routines prevent technical failures, while small buffer stocks of recycled filler guarantee packaging continuity in case of short-term downtime. For transport operations, alternative delivery routes and flexible scheduling are used to handle traffic congestion or weather-related restrictions affecting e-scooter use. If digital or data exchange systems are temporarily unavailable, manual delivery lists and recording templates maintain operational traceability until normal functions resume. Close coordination between LogPoint and Veloce ensures that emerging issues are immediately addressed, minimizing service interruptions and maintaining overall process reliability.

3.3.7 Implementation steps and processes

The pilot is scheduled to start with the planning phase in January. From February onwards, initial data collection shall begin to ensure that no time is lost for optimization and customer acquisition. The involvement of multiple participants will contribute to the overall success of the pilot.

The pilot is scheduled to run until the end of January 2026, covering a full calendar year to capture seasonal variations in delivery volumes. A mid-term review will include customer feedback and, if feasible, an end-customer survey.

By the end of the pilot, a comprehensive dataset will be available, enabling the preparation of a practical manual for other logistics companies facing similar challenges.

LogPoint will collect operational data as the operational pilot partner, while Econsult will evaluate the results within the framework of its study activities. Both partners will jointly analyze the findings and define subsequent implementation steps for LogPoint.

3.3.8 Testing and validation approach

Both scenarios will be tested individually and in combination to verify their technical reliability and operational compatibility.

The carton shredder will be procured and tested under real working conditions to assess its long-term performance. These tests will determine whether the processing capacity meets daily operational needs or whether a second machine may be required to maintain output levels. Particular attention will be given to the device's operational stability, maintenance intervals, and the duration of continuous use without interruptions.

For the transport operations, the test phase will focus on identifying which parcels can be handled efficiently by e-scooter delivery. The analysis will include maximum parcel dimensions and weights, loading and unloading times, and practical usability under normal working conditions. It will also be evaluated whether the stated range of the cargo scooters can be achieved consistently under varying weather and temperature conditions, and at which point an additional transshipment point might be necessary.

Finally, the interaction between both scenarios will be tested to ensure seamless integration. The evaluation will examine whether internal processes run smoothly or require further adjustment, whether the recycled filler material is suitable for the transported product types, and how much of it is actually needed to ensure product safety and efficient operation.

3.3.9 Expected challenges and risk mitigation

The Vienna pilot (LogPoint) faces a set of operational, organizational, and behavioral challenges related to the transition toward a circular, low-emission fulfilment and delivery model. These risks arise primarily from the introduction of new packaging reuse processes, the coordination of zero-emission transport operations, and the integration of digital monitoring tools in daily warehouse routines. The following section identifies the main expected challenges and outlines corresponding mitigation strategies to ensure smooth implementation, operational reliability, and long-term scalability of the pilot.

Operational Integration of Circular Packaging Processes

The introduction of on-site carton recycling and reused filler materials requires adjustments in existing warehouse routines. Space allocation, separation of recyclable and disposable materials, and staff training on correct sorting and machine operation may temporarily affect workflow efficiency. Furthermore, the suitability of the new recycled filler for different product categories must be tested to ensure product protection and hygiene compliance.

Dedicated areas for recyclable materials will therefore be clearly marked within the warehouse to streamline internal logistics, standard operating procedures and visual guides will be established for material handling. Staff will receive targeted training on sorting and shredding procedures. Continuous monitoring and feedback loops will ensure that the process remains efficient and compliant with safety and hygiene requirements.

Coordination between Fulfilment and Zero-Emission Delivery Partners

The transition from conventional parcel shipping via the Austrian Post to coordinated zero-emission last-mile deliveries operated by Veloce introduces a need for synchronization routines. Aligning loading, and delivery schedules between the two organizations may initially cause timing conflicts or underutilized vehicle capacity.

Joint operational reconciliation between LogPoint and Veloce will take place. Shared digital data will support coordination between the fulfilment hub and the micro-mobility fleet. Buffer times will be included in the daily schedule to absorb potential delays.

Data Collection and IT Integration

Accurate monitoring of packaging flows and emission reductions depends on complete and timely data exchange between warehouse system and delivery partner. Since parts of the process (e.g. manual shredding or sorting) are semi-automated, there is a risk of incomplete data capture or inconsistent reporting.

Data entry responsibilities will be explicitly assigned to designated staff at each process stage. Simplified digital templates will be used for recording of recycled versus disposed carton volumes. ECONSULT will review data quality at regular intervals to ensure comparability and completeness before evaluation.

Acceptance and Communication

Customer perceptions regarding reused packaging materials or changed delivery methods may influence acceptance rates. Some business partners may be reluctant to switch from standard parcel services to micro-mobility deliveries, especially for products that require high presentation quality.

Communication with participating partners (initially La Vialla, later other partners) will focus on the environmental and economic benefits of the new system. Marketing materials and delivery labels will highlight the use of recycled fillers and zero-emission transport as added value. Halfway through the project, discussions will be held with participating partners to share experiences, identify any remaining concerns and adjust processes accordingly.

Regulatory and Safety Compliance

The pilot will, of course, comply with municipal waste disposal regulations, occupational health and safety standards, and regulations for the operation of vehicles.

LogPoint will ensure that all activities comply with Austrian legal requirements. Cooperation with local authorities will ensure compliance with regulations and facilitate replication of the approach.

Technical and organizational continuity

Potential equipment failures (e.g. shredder downtime) or staff shortages could temporarily interrupt the circular packaging process and reduce the availability of recycled filling material.

A preventive maintenance plan for the shredder will be introduced, which includes support from the supplier and rapid repair options. In addition, buffer stocks of shredded material will be created. Cross-departmental staff training will ensure that replacement personnel are available at all times.

3.4 Lyon pilot/ SustainSwap

The subsection provides a detailed description of the Lyon pilot, entitled SustainSwap, focusing on the pilot's conceptualization and execution. The section begins with a description of the pilot objectives and overall setup, demonstrating how the pilot integrates reusable packaging, zero-emission PUDO replenishment and zero-emission home delivery into a single, coherent experimentation framework. It then explains the rationale for selecting these elements, together with their alignment with Lyon's urban mobility and logistics strategies, including local ambitions for low-emission delivery, cargo-bike logistics, and circular-economy practices.

Furthermore, the subsection discusses operational requirements, implementation steps and the methodology for physical and digital testing. Expected challenges and associated mitigation strategies are also addressed. SustainSwap provides an opportunity to observe customer behavior, logistics performance and environmental impact across three distinct logistics segments, offering evidence that complements the cross-country analysis with the Polish pilot.

3.4.1 Description of the pilot

General description

The Lyon pilot evaluates the sustainability potential of circular packaging and zero-emission delivery models across different logistics flows serviced by Pick & Smile (P&S). Rather than forming a single integrated partnership, the pilot tests three distinct operational setups that P&S runs with separate clients and supply chains: (1) reusable packaging for Vinted Go's C2C parcels, and two Intermarché-related flows covering (2) zero-emission replenishment of selected Pick & Smile PUDO points using e-cargo bikes, and (3) zero-emission home delivery of grocery orders originating from Intermarché stores. These activities take place independently of one another but collectively form a comprehensive experiment, allowing the project to investigate how circular and low-emission practices can be embedded into different segments of urban logistics (see Table 23).

As mentioned above, SustainSwap is designed as a multi-component experimental environment, addressing three distinct logistics flows:

1. Reusable packaging for Vinted Go C2C shipments, enabling multi-cycle use of parcel packaging and testing behavioral interventions to encourage reuse.
2. Zero-emission replenishment of PUDO points using e-cargo bikes from Pick & Smile's logistics hub, evaluating the operational feasibility and emissions reduction of consolidated parcel flows originating from Intermarché.

3. Zero-emission home delivery of grocery orders from Intermarché stores using e-cargo bikes operated by Pick & Smile, assessing delivery performance, customer acceptance and environmental benefits.

The pilot therefore spans the full trajectory from packaging and drop-off, through PUDO replenishment, to direct-to-home delivery. This integrated design supports the evaluation of circular logistics, operational performance, behavioral responses and environmental outcomes across multiple consumer-facing logistics services.

Table 23. Overview of the SustainSwap Pilot

Basic information	Description
Title of the Pilot	SustainSwap
Region - Country	Lyon - France
Participants	Pick & Smile (GreenTurn partner, PUDO operator & logistics provider); Vinted Go (Client - C2C re-commerce shipping); Intermarché (Client – grocery e-commerce); Consumers using Vinted and Intermarché services
Type of pilot	Consumer-facing C2C logistics, B2C PUDO replenishment, B2C home delivery
Short description	Implementing carbon-free logistics solutions integrating circular packaging and zero-emission last-mile delivery across re-commerce and grocery flows.

Spatial description

The testing activities in Lyon will take place primarily in and around the high-volume Pick & Smile XL point located in the Westfield Lyon Part-Dieu shopping center. This site will serve as the core element of the pilot, as it concentrates significant parcel flows and represents a typical urban PUDO environment with high consumer footfall. A supporting figure 14 (map) will illustrate the exact spatial coverage and the main functional zones used in the pilot.

In addition to the PUDO-based testing, the pilot will also include a home-delivery component operated in cooperation with Intermarché. For this purpose, an Intermarché store within the broader Lyon metropolitan area will act as the local dispatch hub for grocery orders delivered by e-cargo bikes. These home-delivery routes will cover selected central districts of Lyon, ensuring comparability with the PUDO-based operations and enabling the assessment of green last-mile deliveries in a dense urban context.

Together, these two elements — the Westfield Lyon Part-Dieu XL point and the Intermarché-supported home-delivery zone — will allow for a comprehensive evaluation of zero-emission last-mile logistics. The geographical areas selected for the pilot represent typical consumer mobility patterns, diverse urban fabrics, and varying levels of accessibility, which are visualized in the map below (Figure 14).

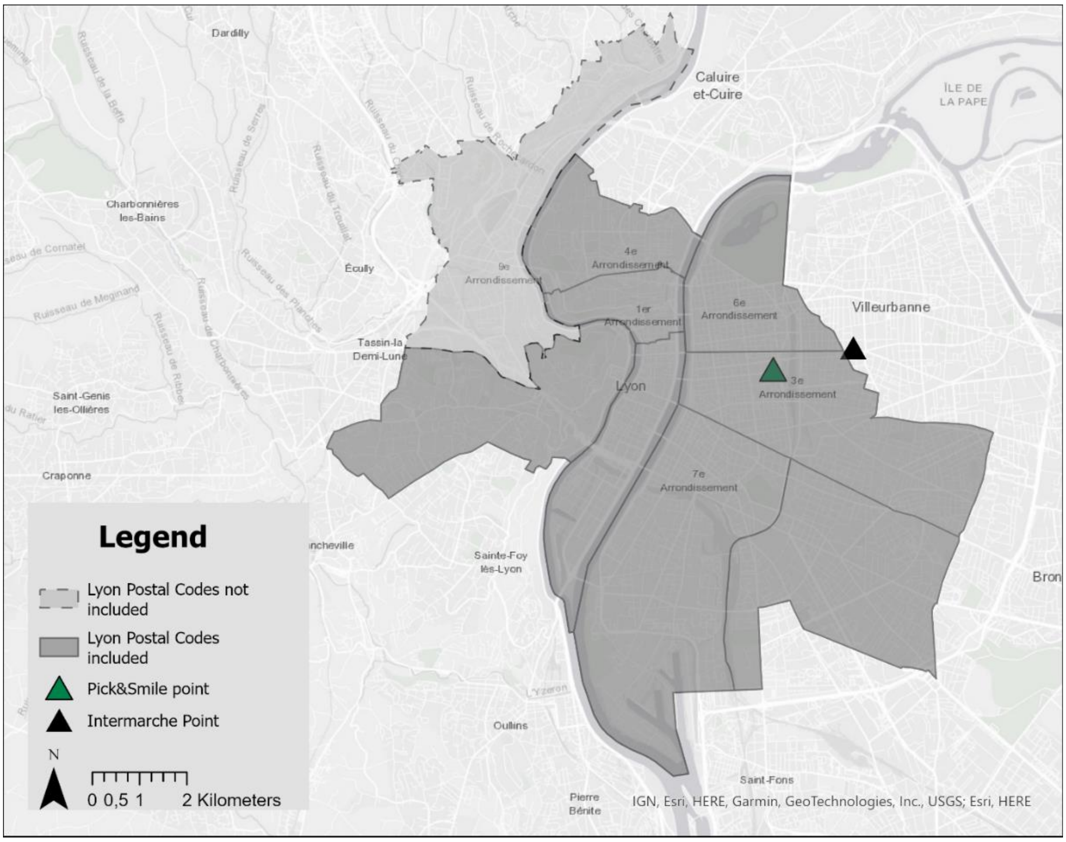

Figure 14. Spatial Coverage of the Lyon Pilot

3.4.2 Main elements of the SustainSwap Pilot

As stated before, the Lyon pilot builds on the operational reality of Pick&Smile as a high-volume PUDO operator and introduces two additional layers of innovation: (1) reusable packaging loops, and (2) zero-emission last-mile services based on e-cargo bikes, including both delivery to Pick&Smile points and home delivery in cooperation with Intermarché. The combined approach links behavioral, operational and environmental dimensions, forming an integrated model for greener last-mile logistics.

The pilot is organized around five core elements described below:

1. Reusable Packaging Loop and Consumer Engagement

This component introduces a structured reusable packaging system into Pick & Smile's existing parcel flows. The solution tested in Lyon is based on reusable textile and polypropylene-based pouches equipped with QR codes, enabling full tracking of circulation cycles and user behavior (example in Figure 15). The approach relies on two key steps:

- Activation at the PUDO point: customers collecting parcels at the Pick & Smile XL point can directly access reusable packaging as part of the Vinted Go flow, using a guided digital prompt.

- Reuse and return cycle: customers can re-use the package for future shipments, with optional digital nudges (e.g., changed messages, icons, environmental metrics) encouraging repeated circulation.

Figure 15. Reusable packaging example for the Lyon pilot (Source: https://www.reutec.fr/)

The system captures data on first use, subsequent uses, and return patterns, enabling an assessment of the real reuse potential and the effectiveness of communication strategies (e.g., CO_2 savings, "saved trees", green-leaf indicators).

2. Zero-Emission Delivery from Pick & Smile PUDO Points

The second element of the SustainSwap focuses on replacing conventional feeder transport with e-cargo bikes operated by Pick&Smile. These vehicles will supply selected PUDO locations with consolidated parcels coming from Intermarché. The process integrates:

- loading operations at the Pick & Smile preparation point,
- multi-stop feeder rounds to staffed PUDOs,
- data collection on routing, volumes and operational stability.

This shift allows Pick & Smile to experiment with a hybrid model combining parcel consolidation with zero-emission movement between its own sites. It tests operational feasibility, routing efficiency and the value of integrating soft-mobility vehicles into PUDO-based networks.

3. Zero-Emission Home Delivery in Cooperation with Intermarché

In addition to hub-PUDO operations, the pilot also introduces a dedicated home-delivery service for groceries and selected everyday products, operated with electric cargo bikes equipped with insulated, closed containers. The service is organized by a nearby Intermarché store that acts as a local preparation hub, while Pick&Smile provides and operates the e-cargo bike fleet, including the modular trailers used for transporting the orders.

The bikes will be fitted with K-Ryole V6 utility trailers (see Figure 16), which are designed specifically for last-mile distribution in dense urban areas. Their 1.3 m^3 enclosed module and high payload capacity (up to 250–350 kg) make it possible to transport full grocery baskets in a safe and weather-protected manner. The trailers include RFID-secured access, a closed loading space, and a stable, pedestrian-mode maneuvering option, which is practical for navigating courtyards and complex residential layouts. Depending on operational needs, the module can be used with or without additional interior insulated boxes for maintaining temperature-sensitive products.

Within the pilot, the home-delivery service aims to examine:

- How well zero-emission cargo bike delivery performs in high-density areas of Lyon, particularly in zones with traffic restrictions or limited parking.
- Operational parameters, such as routing patterns, achievable time windows, load factors and daily ranges in real customer conditions.
- Customer experience and behavioral reactions, including the perceived reliability and convenience of receiving groceries via a fully electric, quiet and low-impact vehicle.
- Integration with existing retail logistics, assessing how smoothly the Intermarché picking processes, Pick&Smile operations and customer interfaces can be connected.

In this setup, the home-delivery component complements the PUDO-based activities by providing a second, fully operational zero-emission service line, allowing the project to evaluate different use cases: one focused on parcel consolidation and another on grocery home delivery. The findings will help determine the conditions under which e-cargo bikes can offer a scalable, commercially viable and environmentally effective alternative to conventional van-based distribution in urban areas.

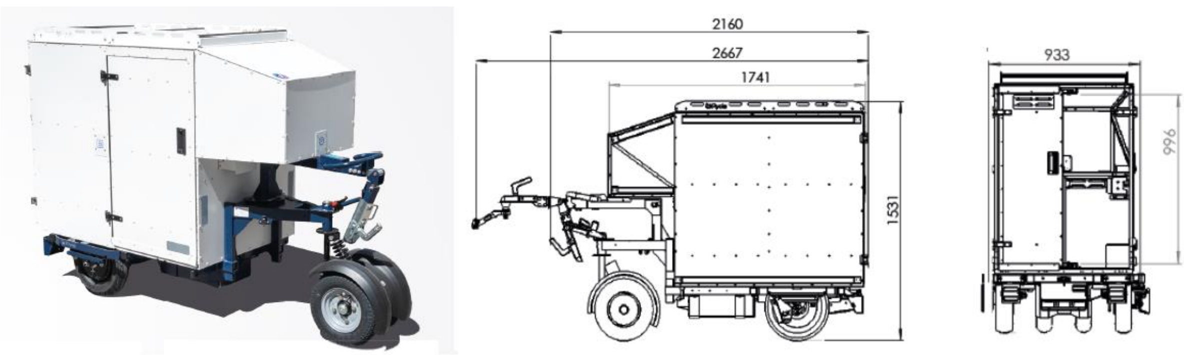

Figure 16. E-cargo bike and insulated container module planned for the pilot

4. Digital Integration and Behavior-Informed Communication

The pilot incorporates digital tools that support operational monitoring, transparency, and user engagement. These tools are anchored in Pick & Smile's existing digital environment, notably the SMIL platform coupled with SMIL@IA, which together enable the tracking of routes and parcels managed by Pick & Smile (see Figure 17). SMIL@IA supports the prediction of PUDO locations, anticipation of parcel flows, and real-time optimization of delivery routes, providing an operational backbone for both feeder and home-delivery activities.

Within this framework, the pilot integrates:

- QR-based tracking for reusable packaging,
- monitoring of e-cargo bike routes and delivery performance indicators through SMIL / SMIL@IA,
- digital prompts and sustainability-related messaging at the PUDO interface.

The Lyon activities build on behavioral insights developed earlier in the project, particularly regarding framing strategies and the influence of simple, visible cues on consumer choices. The pilot therefore tests different communication variants (visual cues, short messages, benefit-oriented framing) directly linked to reusable packaging and zero-emission delivery options, while relying on the SMIL digital infrastructure to ensure consistent monitoring and data availability.

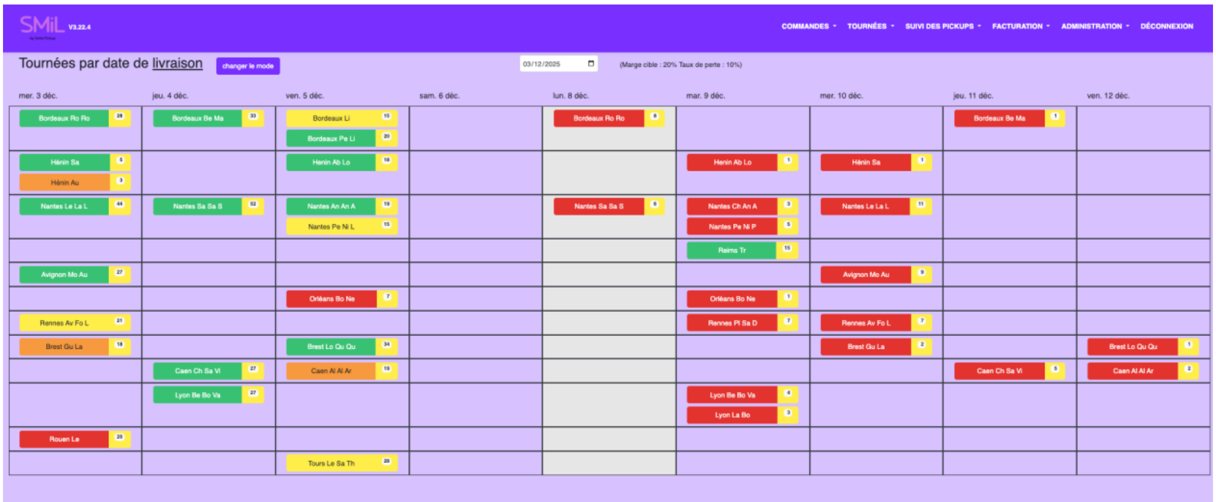

Figure 17. The SMIL platform outlook

5. Operational Coordination and Organizational Adaptation

The dual innovation introduced in Lyon pilot: reusable packaging and zero-emission delivery requires coordinated adjustments within Pick & Smile's existing operational processes. These adjustments are supported by Pick & Smile's digital environment (SMIL and SMIL@IA), which provides real-time visibility over parcel flows and delivery routes, but they do not imply a restructuring of the company's operating model. Instead, the pilot focuses on incremental organizational adaptations that can be tested under real operating conditions.

Specifically, the pilot examines:

- adjustments in parcel handover and handling procedures at high-volume PUDO locations, supported by SMIL-based visibility of incoming and outgoing flows,
- integration of reusable packaging activation, tracking and return handling into routine staff workflows at Pick & Smile points,
- scheduling and operational planning of e-cargo bike rounds, informed by SMIL@IA-supported route optimization and flow anticipation,
- coordination routines with Intermarché for the home-delivery component, including order handover, time-window alignment and operational feedback loops.

Through these adaptations, the pilot provides practical insights into how medium-scale PUDO networks can incorporate additional functions, such as reusable packaging loops and zero-emission micro-distribution, while maintaining operational stability, flexibility and replicability in other European urban contexts.

3.4.3 Description and evaluation of pilot scenarios

The evaluation of the Lyon pilot alternatives follows the same four assessment criteria applied across all GreenTurn pilots: (i) regulatory compliance, (ii) emissions impact, (iii) technological integration, and (iv) scalability & agility. However, in the Lyon case these criteria are also interpreted through the specific strategic, regulatory and operational conditions that shape urban logistics in the Métropole de Lyon.

Lyon's Orientation Logistique Urbaine (Urban Logistics Orientation Document) sets a clear long-term direction for freight activity: reducing logistics-related emissions, limiting the presence of large vehicles in dense areas, reorganizing flows through consolidation points, and supporting low-impact delivery modes such as cargo bikes. Parallel initiatives, such as the progressive tightening of the Crit'Air vehicle restrictions, the extension of the Low-Emission Zone (ZFE), differentiated paid parking policies, and the upcoming ZTL "Presqu'île à Vivre" traffic-calming project, collectively signal that future logistics operations must be compact, zero-emission, and space-efficient. These developments provide an important policy "vector" for assessing scenario feasibility.

At the same time, the evaluation reflects the business and operational profile of Pick & Smile, the main logistics actor involved in the Lyon pilot. Pick & Smile operates a dense network of staffed PUDO points and positions itself as a neutral B2B service provider facilitating consolidated urban delivery. The company does not operate a traditional transport fleet and relies on partnerships for distribution activities. Its model favors footprint reduction, service reliability, and consumer-facing convenience, while allowing modular extensions such as zero-emission distribution or circular packaging flows. Any viable scenario must therefore align not only with municipal logistics ambitions but also with Pick & Smile's operational reality and competitive positioning.

Against this backdrop, the four evaluation criteria are applied as follows:

1. **Regulatory compliance.** This criterion assesses how well each scenario fits current and upcoming mobility and environmental regulations in Lyon. Particular attention is given to the ZFE restrictions on diesel and older petrol vehicles, expected future expansions of low-traffic areas, and municipal parking and access rules that increasingly favor light electric vehicles and cycling-based logistics.
2. **Emissions impact.** This dimension evaluates each scenario's potential to reduce CO_2 and urban pollutants within the constrained delivery zones around Part-Dieu and central Lyon. The assessment considers both direct tailpipe emissions and indirect impacts related to route efficiency, vehicle type, and the potential to replace van-based delivery with lighter zero-emission modes.
3. **Technological integration -** evaluates the degree to which each scenario can incorporate data flows, tracking tools, and digital coordination mechanisms aligned with GreenTurn's behavioral and environmental monitoring approach. For Lyon, emphasis is placed on the feasibility of integrating emissions-aware routing, item-level tracking (e.g., reusable packaging), and consumer-facing digital nudges.
4. **Scalability & agility.** This criterion refers to each configuration's potential to expand across additional PUDO points, delivery zones, or partner networks without requiring disproportionate investment or complexity. In the Lyon market (characterized by dense urban structure, limited curb space, and evolving mobility regulations) scalability favors compact, flexible logistics modes and business models that can adjust quickly to new policy restrictions or partnership opportunities.

Together, these criteria create a structured and context-sensitive basis for comparing four alternative last-mile delivery configurations for Lyon. The evaluation determines which scenario best aligns with Lyon's regulatory trajectory, environmental objectives, and Pick & Smile's operational capabilities, ultimately justifying the selection of the preferred configuration for pilot implementation.

Scenario 1: Continuation of conventional delivery using standard carrier Vans

The first scenario assumes that parcel flows to Pick&Smile PUDO points remain handled entirely by conventional logistics operators using internal combustion engine (ICE) vans. This model reflects the status quo of last-mile delivery in many parts of Lyon: dense flows of multi-carrier vans accessing central districts throughout the day, without coordination or consolidation efforts beyond basic industry practice. Pick&Smile would act only as an end-point handover location, without any changes in operations or technology.

Although simple to maintain, this configuration faces increasing tension with Lyon's regulatory environment. The ongoing expansion of the Zone à Faibles Émissions (ZFE) limits access for older diesel and petrol vehicles and will tighten further in the coming years. At the same time, municipal strategies emphasize noise reduction, improved walkability and a reduction of delivery van activity in dense areas such as Part-Dieu and the Presqu'île. The scenario offers no support to those objectives and does not allow Pick&Smile to explore more sustainable or innovative practices within GreenTurn. Table 24 summarizes the evaluation of Scenario 1 against regulatory compliance, emissions impact, technological integration and scalability.

Table 24. Evaluation of Scenario 1

Evaluation Criteria	Score (1-5)*	Justification
Regulatory Compliance	1	Increasingly incompatible with ZFE restrictions and traffic-limiting policies.
Emissions Impact	1	High CO_2 and pollutant emissions from ICE vans; no mitigation measures.
Technological Integration	1	No digital tools, no monitoring, no new processes.
Scalability & Agility	2	Operationally stable, but highly exposed to regulatory tightening and long-term constraints.

* Scores are on a scale from 1 (low) to 5 (high).

Scenario 2: Introduction of reusable packaging without changes in delivery fleet

The second scenario focuses on environmental improvement through the introduction of reusable packaging at Pick&Smile locations, while maintaining current delivery methods and vehicle types. Pick&Smile would distribute reusable parcels to Vinted users and collect returned carriers at the Lyon Part-Dieu XL PUDO, enabling circular use cycles. Consumers would be encouraged to reuse packaging through simple digital prompts or at-point signage. The operational process is feasible, requires limited infrastructure, and aligns with the company's service logic.

For Lyon Métropole, circular packaging aligns with waste-reduction objectives and the Logistics Orientation Document's emphasis on resource-efficient urban logistics. However, it does not reduce vehicle movements nor address congestion in dense districts. From Pick & Smile's operational standpoint, the scenario is feasible and low-risk: it requires staff training and customer communication but no restructuring of the transport leg. Nonetheless, it does not address persistent first-leg inefficiencies nor strengthen P&S's strategic role in logistics coordination. Table 25 summarizes the evaluation of Scenario 2 across regulatory compliance, emissions impact, technological integration, and scalability.

Table 25. Evaluation of Scenario 2

Evaluation Criteria	Score (1–5)*	Justification
Regulatory Compliance	3	Strongly aligned with circular economy ambitions; no vehicle restrictions involved.
Emissions Impact	2	Reduces packaging waste but no impact on transport-related emissions.
Technological Integration	3	Requires packaging tracking and return workflows; moderate digital integration.
Scalability & Agility	3	Easy to replicate across PUDO points; limited systemic impact on last-mile logistics.

* Scores are on a scale from 1 (low) to 5 (high).

Scenario 3: Zero-Emission deliveries from Hub to PUDO (e-cargo bikes supplying P&S locations)

This scenario introduces e-cargo bike delivery for the upstream leg between an Intermarché consolidation or preparation hub and designated Pick & Smile PUDO points. P&S becomes an active operator of this transport segment for the first time, purchasing and managing its own cargo bikes with insulated containers and swappable trailers. This transforms P&S from a purely passive PUDO operator into a micro-distribution actor capable of controlling routing, frequencies, and environmental performance.

This model aligns very well with Lyon's logistics strategy: reducing van entries into dense districts, promoting active-mode freight, and supporting micro-hub-based consolidation. It lowers VKT in sensitive areas such as Part-Dieu and meets ZFE requirements regardless of carrier practices. Operationally, the scenario introduces coordination responsibilities (routing, scheduling, handover points), but the distances involved match the capabilities of e-cargo equipment used in comparable European contexts. It strengthens Pick&Smile's long-term business model by building in-house micro-distribution capacity and demonstrating compliance with urban logistics trends. Table 26 presents the scoring results for Scenario 3 and explains the main reasons behind each score.

Table 26. Evaluation of Scenario 3

Evaluation Criteria	Score (1–5)*	Justification
Regulatory Compliance	4	Fully aligned with ZFE objectives, smog-alert restrictions, and Lyon's shift toward light electric vehicles and micro-distribution.

Emissions Impact	4	Significant reduction of delivery-leg emissions and vehicle-kilometers in dense areas; clear improvement over external carriers.
Technological Integration	3	Moderate integration: routing optimization, fleet monitoring, and traceability of feeder flows; still no integration with full end-customer journey.
Scalability & Agility	3	Strong operational benefits at high-volume points (Part-Dieu) but requires fleet investment, coordination with carriers, and adaptation of PUDO processes.

* Scores are on a scale from 1 (low) to 5 (high).

Scenario 4: Zero-emission deliveries to PUDO combined with zero-emission home delivery (P&S and Intermarché Model)

The fourth scenario represents the complete configuration selected for the Lyon GreenTurn pilot, combining reusable parcel packaging, zero-emission deliveries to PUDO points, and e-cargo-bike home deliveries for selected retail flows. This model builds directly on Pick & Smile's operational structure but extends it in two strategic directions: greener first-leg deliveries and an expanded last-mile role.

The scenario begins with the introduction of reusable packaging for Vinted flows handled through the Pick & Smile network. Parcels arrive at the Pick & Smile XL point in Lyon Part-Dieu, where customers returning items or sending new transactions are invited to reuse durable packaging formats. These packages, manufactured from recyclable and upcycled materials in several size variants, are designed for multiple lifecycles and integrate easily into P&S's staffed-PUDO environment. Their introduction helps Pick & Smile acquire new operational experience in handling reusable packaging at scale—something not possible with locker-based networks—and aligns with Lyon's ambitions to reduce waste and accelerate circular-economy logistics.

The second element of the scenario replaces conventional van deliveries to the Part-Dieu XL point with zero-emission e-cargo-bike feeder routes operated by Pick & Smile. Using insulated modular containers, these bikes collect parcels from an upstream consolidation hub and deliver them directly to the PUDO in high-frequency rounds. This shift allows Pick & Smile to take partial control of the first-leg transport into its busiest site, something the company does not manage under the traditional carrier-led delivery model. In operational terms, it supports more predictable delivery waves, better planning of staff workload, and reduced congestion at peak hours. In environmental terms, it supports the city's Logistics Orientation strategy by decreasing VKT, eliminating tailpipe emissions, and demonstrating micro-distribution in an area where conventional vans face growing Crit'Air restrictions.

The third and final component introduces zero-emission home delivery for groceries and selected Intermarché products. In this service, the e-cargo bikes used for PUDO feed operations are also deployed as home-delivery vehicles, collecting orders from a nearby Intermarché store that acts as a micro-hub. Pick & Smile provides the vehicle fleet and operational interface, while Intermarché supplies the orders and coordinates store-level preparation. This setup allows the pilot to test whether zero-emission home delivery can function reliably within dense districts of Lyon and whether customers show greater acceptance of green delivery options when they are seamlessly embedded in familiar grocery-shopping routines.

Together, these elements create a fully integrated scenario that simultaneously addresses packaging sustainability, first-leg decarbonization, and last-mile flexibility. For Pick & Smile, this scenario is the only one that improves upstream delivery control, reduces operational uncertainty at high-volume PUDOs, and opens a pathway to new revenue models through combined PUDO and home delivery services. For Lyon, it is the configuration most consistent with regulatory trends, especially the tightening Crit'Air requirements, upcoming ZTL implementation, and the Métropole's long-term ambition to shift deliveries toward active-mode and low-impact vehicles. The scenario provides a coherent and policy-consistent model for urban logistics in dense urban areas and represents the strongest alignment between operator capabilities, city policy directions, and GreenTurn's sustainability objectives. Table 27 provides the evaluation results for Scenario 4.

Table 27. Evaluation of Scenario 4

Evaluation Criteria	Score (1–5)*	Justification
Regulatory Compliance	5	Fully in line with Lyon's shift towards low- and zero-emission logistics (ZFE, future ZTL) and with municipal support for cargo-bike and micro-distribution solutions.
Emissions Impact	5	Combines reduced vehicle-kilometers from bike-based delivery with substitution of van trips and lower material footprint through reusable packaging; strongest potential for CO_2 and pollutant reduction among the scenarios.
Technological Integration	4	Requires coordination of packaging tracking, operational data for e-cargo routes and basic monitoring of performance; uses existing digital

		tools but does not yet rely on a full orchestration platform.
Scalability & Agility	4	High potential to extend to additional PUDO points, delivery zones and product flows; however, scaling will depend on bike fleet growth, partner engagement and stable business conditions.

* Scores are on a scale from 1 (low) to 5 (high).

3.4.4 Description of most promising pilot scenario

Based on the scenario assessment and comparative evaluation presented in the preceding sections, Scenario 4 is selected as the most promising minimum viable product (MVP) configuration for the Lyon pilot. This scenario demonstrates the strongest alignment with Lyon Métropole's regulatory trajectory, Pick & Smile's operational capabilities, and GreenTurn's objectives related to circular logistics, zero-emission transport, and behavioral change.

Scenario 4 combines three complementary elements within a single analytical configuration: (i) reusable packaging integrated into Vinted Go C2C flows at Pick & Smile PUDO points, (ii) zero-emission feeder deliveries to Pick & Smile PUDO locations using e-cargo bikes operated by Pick & Smile for Intermarché-originating flows, and (iii) zero-emission home delivery of grocery orders from Intermarché stores using the same e-cargo bike fleet.

While these elements remain operationally distinct, their joint implementation within the pilot allows for an integrated assessment of packaging circularity, first-leg decarbonization, and last-mile delivery performance under real urban conditions. Scenario 4 is therefore designated as the preferred pilot configuration and serves as the reference case for operational testing, monitoring and evaluation in Lyon (see Table 28).

Table 28. Lyon Pilot (SustainSwap) Identification

Pilot's ID	
Pilot's ID	GreenTurn-LYO-SS-101147942
Title of the Pilot	SustainSwap
Description	B2C and C2C sustainable last-mile logistics integrating reusable packaging in the Vinted Go C2C flow, zero-emission PUDO replenishment, and zero-emission grocery home delivery in the urban area of Lyon.
Mode of transportation	Electric cargo bikes with modular insulated containers and utility trailers (operated by Pick & Smile).
Spatial information	Lyon metropolitan area; operations centered on the Pick & Smile XL PUDO point at Westfield Lyon Part-Dieu and selected home-delivery districts served from an Intermarché store.

Information technology	SMIL operational platform with SMIL@IA decision-support modules for parcel and route tracking, flow anticipation, real-time route optimization, and performance monitoring, supported by Pick & Smile's internal Data Lake.
Parameters tested	Reusable packaging circulation in the Vinted Go C2C flow, PUDO-based parcel consolidation, zero-emission feeder deliveries for Intermarché, zero-emission home delivery, behavioral nudges at PUDO interfaces, route optimization with cargo bikes

This section provides a comprehensive analysis of the most promising configuration selected for the SustainSwap pilot.

A. Reusable packaging activation at PUDO points

Reusable packaging is introduced at the Pick & Smile XL PUDO point in Westfield Lyon Part-Dieu as part of the Vinted Go C2C flow. Customers collecting or sending parcels are offered reusable textile or polypropylene pouches and receive short guidance from PUDO staff on correct usage and scanning procedures. Each packaging unit is equipped with a QR code that is activated at the PUDO point and recorded within Pick & Smile's systems.

Packaging circulation events (first use, reuse, return) are logged by staff as part of standard operating procedures and stored within the SMIL platform and Data Lake. Behavior-informed prompts placed at the PUDO interface encourage reuse by highlighting simplicity and environmental benefits. This component allows the pilot to assess real reuse rates, user acceptance, and operational implications of introducing circular packaging in a staffed PUDO environment.

B. Zero-emission feeder deliveries to Pick & Smile PUDO points

For Intermarché-originating parcel flows, conventional van-based feeder deliveries to the Part-Dieu XL PUDO are replaced by **zero-emission e-cargo bike operations managed by Pick & Smile**. Parcels are consolidated at an Intermarché preparation or consolidation hub and transported to the PUDO location using electric cargo bikes equipped with insulated modular containers.

Prior to each delivery round, vehicles undergo standard safety and functionality checks. Delivery volumes, routing assumptions and time windows are processed within the SMIL/SMIL@IA environment, which supports route optimization and operational planning. During execution, delivery progress, arrival times and operational events are logged digitally, allowing calculation of avoided vehicle-kilometers and comparison with conventional van-based operations.

This feeder-delivery component tests the feasibility of shifting first-leg urban logistics into zero-emission, light-vehicle operations while maintaining reliability at a high-volume PUDO site.

C. Zero-emission home delivery from Intermarché

The same e-cargo bike fleet is also used for zero-emission home delivery of grocery orders originating from a selected Intermarché store within the Lyon metropolitan area. Intermarché prepares orders at store level, while Pick & Smile operates the delivery vehicles and riders.

Routes are planned using Pick&Smile's decision-support tools, taking into account delivery density, time windows, and vehicle capacity. During execution, riders follow predefined cycle-safe routes and deliver orders using insulated containers to ensure product integrity. Delivery completion, timing and rider observations are recorded digitally and stored in the Data Lake.

This component allows the pilot to assess customer acceptance, delivery reliability, and operational constraints of cargo-bike-based grocery delivery in dense urban districts, particularly in areas affected by traffic restrictions and limited curb access.

D. Digital coordination, monitoring and execution

All operational components of the selected scenario are supported by Pick & Smile's digital infrastructure. The SMIL platform, complemented by SMIL@IA modules, provides real-time visibility of parcel flows, vehicle routes and delivery progress. Operational data are consolidated in the Pick & Smile Data Lake and exported to reporting templates for KPI monitoring.

Digital tools support:

- registration of reusable packaging events,
- monitoring of feeder and home-delivery routes,
- operational performance tracking (time, distance, load factors),
- extraction of datasets for environmental and behavioral evaluation.

The pilot does not introduce a new orchestration platform but relies on incremental use of existing digital systems, ensuring realism and replicability.

E. Performance review and continuous improvement

Operational performance is reviewed periodically using data extracted from SMIL and the Data Lake. Indicators include delivery punctuality, packaging reuse cycles, route efficiency, rider feedback and customer response. Based on these reviews, adjustments may be introduced to routing assumptions, delivery frequencies, packaging availability or communication materials.

This iterative approach ensures that the selected MVP scenario remains adaptable to real-world constraints while generating robust evidence on the feasibility and impact of integrated circular and zero-emission logistics in Lyon.

3.4.5 Alignment of pilot with local SUMPs/SULPs

The SustainSwap pilot was designed to align with the urban logistics and mobility priorities of the Lyon Métropole, as articulated in its *Logistics Orientation Document* (Orientation Logistique Urbaine)[2]. While Lyon does not operate a standalone Sustainable Urban Logistics Plan (SULP) in the formal sense, the Logistics Orientation Document fulfils a comparable strategic function by defining a coherent framework for organizing freight transport, reducing logistics-related emissions, and supporting low-impact delivery solutions in dense urban areas.

The Logistics Orientation Document establishes four main pillars that guide the transformation of urban logistics in Lyon. The SustainSwap pilot contributes directly to each of these pillars through its operational design and choice of tested solutions.

First, the pilot supports improved use of urban land for logistics by reinforcing the role of high-volume Pick & Smile PUDO points as micro-distribution nodes. By shifting feeder deliveries and selected home-delivery flows to e-cargo bikes, the pilot contributes to the reduction of large vehicle presence in dense areas such as Part-Dieu, aligning with the city's objective of encouraging compact logistics facilities and logistics "hotels" that enable modal shift away from conventional vans.

Second, the pilot directly contributes to the development of multimodality in urban logistics. The use of electric cargo bikes for both PUDO replenishment and home delivery reflects Lyon Métropole's emphasis on cycling-based freight solutions, supported by investments in cycling infrastructure and targeted measures for cycle logistics operators. SustainSwap operationally demonstrates how cargo bikes can be integrated into daily logistics flows, complementing existing upstream transport modes without requiring large-scale infrastructure changes.

Third, the pilot aligns with the regulatory and standardization objectives set out in the Logistics Orientation Document. Lyon's progressive tightening of access regulations, including the extension of the Zone à Faibles Émissions (ZFE) and the planned introduction of traffic-limited areas (ZTL), creates a strong incentive for zero-emission delivery modes. By relying exclusively on electric cargo bikes for the tested flows, the SustainSwap pilot operates fully within current and anticipated regulatory constraints, demonstrating compliance with low-emission access rules and harmonized delivery-area policies.

[2] https://www.grandlyon.com/fileadmin/user_upload/media/pdf/deplacements/orientation-logistique-urbaine.pdf

Fourth, the pilot addresses the pillar related to raising awareness of logistics impacts. Through the introduction of reusable packaging in the Vinted Go C2C flow and the use of behavior-informed communication at PUDO points, SustainSwap contributes to making logistics impacts more visible to end users. Simple digital cues and messaging link individual consumer actions, such as reusing packaging or accepting low-impact delivery options, to broader environmental objectives, thereby supporting Lyon Métropole's ambition to integrate logistics considerations into everyday urban practices and project planning.

In addition to local alignment, the SustainSwap pilot is consistent with broader European policy directions, including the EU Sustainable and Smart Mobility Strategy, by combining decarbonization of urban freight with digital monitoring and behavioral innovation. The pilot therefore operates at the intersection of local regulatory priorities and European strategic objectives, reinforcing its relevance and transferability.

3.4.6 Operational requirements

The Lyon pilot will be executed through a structured set of operational and monitoring activities combining three innovations: (1) reusable packaging integrated into the Vinted flow at Pick & Smile locations, (2) zero-emission feeder deliveries from an Intermarché consolidation or preparation hub to the Lyon Part-Dieu XL PUDO, and (3) zero-emission home delivery from an Intermarché store to selected districts of the metropolitan area. These components will be deployed through coordinated preparation, live operations, digital monitoring, and post-pilot evaluation. The pilot builds on Pick & Smile's existing PUDO network and service processes, expanding them into an integrated green logistics model aligned with ongoing developments in Lyon Métropole's urban-freight policies.

Operational Timeline and Milestones

Pilot implementation follows the physical and digital timelines defined jointly with Pick & Smile. Activities are organized into four phases.

Preparatory Phase: This phase establishes the technical, organizational and behavioral foundations required for a smooth pilot launch. It brings together all elements related to reusable packaging, e-cargo bike operations, delivery-zone definition and data collection. Preparatory activities involve both Pick&Smile and partner organizations and take place before the start of physical and digital testing. It includes:

- *Reusable packaging setup.* Pick & Smile procures the reusable packaging batches, verifies their condition and prepares the material for distribution at the Part-Dieu XL point. This includes configuring the identification system for each packaging unit, assigning and testing QR codes, and ensuring that the traceability spreadsheet and return-logging procedures function correctly. Staff at the XL point receive a short briefing on the new workflow, signage is installed at the counter, and support materials are prepared to guide customers through scanning and correct use.

- *E-cargo bike and container preparation.* Pick&Smile completes the purchase of the e-cargo bikes and the insulated containers required for feeder operations and home delivery. The bikes undergo safety checks, basic configuration and rider familiarization. Operational procedures for daily preparation, loading and handover are established to ensure consistency between feeder routes and the grocery home-delivery service operated together with Intermarché.
- *Definition of delivery zones and routing assumptions.* Ahead of live testing, the pilot team confirms the delivery zones for feeder operations to the Part-Dieu XL point and the home-delivery catchment area around the Intermarché store. Preliminary routing assumptions and time-window constraints are defined, together with fallback procedures for peak-load days or weather-related disruption. This provides a reference point for both scenario testing and later performance evaluation.
- *Digital and behavioral preparation.* Digital preparation mirrors the physical setup and includes alignment with behavioral personas, clarification of nudge concepts to be used during the pilot, and the definition of required data fields for monitoring emissions, routing patterns and reusable-packaging cycles. Tracking spreadsheets and reporting templates are finalized, drawing on data extracted from the SMIL platform and the Pick & Smile Data Lake, ensuring that physical and digital datasets can be combined during the evaluation stage.

The preparatory phase ensures that all technical components, operational processes and monitoring tools are in place before full-scale pilot operations begin.

Pilot Launch and Initial Operations: Once preparations are in place, controlled operational cycles are initiated:

- First reusable-packaging distribution batches are introduced at the Part-Dieu XL point, with staff guiding users and collecting early feedback;
- Initial feeder deliveries from the central hub to the PUDO are executed using e-cargo bikes under simplified routing assumptions to validate load capacity, parking procedures and handover processes;
- Trial home-delivery cycles are run from the selected Intermarché store, covering a limited zone to verify timing, reliability and rider workload.

Early operational issues are documented and resolved before expanding to the full implementation window.

Full Pilot Operations: In the main phase, all three components operate at steady state:

- Reusable packaging circulates continuously through customer shipments, returns and additional reuse cycles;
- Daily feeder e-cargo operations supply the XL point according to consolidated manifests;
- Home deliveries are executed across designated postal zones according to predefined time windows.

Throughout this period, operational, behavioral and environmental data are monitored, and mid-term adjustments may be introduced to routing, communication materials or packaging distribution intensity.

Final Consolidation and evaluation: In the closing phase, all operational and digital datasets are consolidated. Evaluation covers:

- packaging reuse cycles and user uptake,
- feeder and home-delivery reliability,
- emissions-related indicators,
- staff feedback, consumer reactions and operational feasibility.

The results form the basis for the pilot's final reporting and transferability analysis.

Roles and Responsibilities

The Lyon pilot relies on coordinated action across several partners who jointly support the introduction of reusable packaging, feeder deliveries to Pick&Smile points using e-cargo bikes, and zero-emission home delivery from Intermarché. Although each component operates independently, their successful integration requires clear operational ownership, defined interfaces, and shared data-collection responsibilities. The following section outlines the roles of the core participants and describes how they contribute to a consistent, monitorable pilot environment.

Pick & Smile (Pilot Lead for Lyon): Pick & Smile is responsible for the end-to-end execution of all physical processes tested in the pilot. Their responsibilities include:

- Procurement and deployment of reusable packaging, including ensuring packaging availability at P&S points, installing QR-coded tracking materials, and briefing staff on distribution and return procedures.
- Activation of packaging in the parcel flow, including linking packaging IDs to parcels and customers through the P&S-Reutec integrated tracking system.
- Management of feeder deliveries using newly purchased e-cargo bikes, including vehicle availability, maintenance, rider allocation, safety routines, and ensuring compliance with local mobility regulations.

- Operational setup and day-to-day functioning of the XL PUDO point at Westfield Part-Dieu, including customer support, handling of reusable packaging, and facilitation of data collection.
- Coordination of digital tracking, including the capture of parcel lifecycle data, behavioral indicators, and operational metrics needed for physical and digital evaluation.
- Internal training and quality assurance, making sure staff use the new procedures consistently and that data is logged correctly.
- Liaison with Intermarché, ensuring smooth handover of goods for home delivery operations carried out via Pick & Smile e-cargo bikes.

Overall, Pick & Smile acts as the operational backbone of the pilot and the main point of integration between physical logistics, behavioral nudges, and digital data.

Intermarché (Home-delivery partner): Intermarché provides the product flows required for the zero-emission home-delivery component. The Intermarché store acts as the local hub from which Pick & Smile riders carry out grocery deliveries using e-cargo bikes. Intermarché prepares orders, ensures correct handover to riders, and collaborates on defining time windows, loading procedures, and product constraints. Intermarché offers operational feedback throughout the pilot, supporting iterative adjustments to routing, delivery schedules, and customer communication.

Vinted Go (Market-platform partner for the reusable-packaging flow): Vinted Go participates in the pilot as the platform through which the reusable packaging is introduced into a real consumer flow. While Pick & Smile procures the reusable packaging, manages stock, and operates the full QR-code tracking system, Vinted Go acts as the ecosystem partner enabling these packages to circulate within the Vinted community. Vinted Go provides information necessary to identify which parcels enter the reusable-packaging flow (e.g., labels or parcel identifiers), allowing Pick & Smile to match the physical packaging with the correct transaction. The company also collaborates on communication framing and supports user-facing messages encouraging the use and reuse of the packaging.

Vinted Go does not operate the tracking system itself but ensures operational compatibility and smooth integration of the reusable packaging within its existing logistics flow. As a marketplace and logistics orchestrator, it offers insights into user behavior and supports the pilot as a key retail-ecosystem stakeholder. This cooperation allows Pick & Smile to analyze how reusable packaging performs in a large, active second-hand market and to assess the environmental, behavioral, and operational implications.

GreenTurn Research and Evaluation Partners: The research partners provide methodological guidance, ensure correct implementation of behavioral nudges, and specify data-collection requirements for both the physical and digital phases. They support Pick&Smile in setting up monitoring templates, aligning KPI definitions, and validating tracking protocols. During the pilot, research partners analyze operational data, behavioral responses, and early performance indicators, contributing to iterative improvements and final evaluation.

Workflow for Pilot Operations

Introduction and Activation of Reusable Packaging

Reusable packaging is offered directly at the Part-Dieu XL PUDO point. Customers are encouraged to pick up a package, prepare their Vinted shipment, and scan the QR code. Pick & Smile's system links the scan to anonymized parcel information supplied through the Vinted Go flow. The system records packaging uptake, reuse cycles, and customer interactions. Communication at the PUDO point provides simple messages on environmental benefits and ease of use. Data is exported through API or file to feed environmental, behavioral and operational evaluation.

Feeder Deliveries from Hub to Part-Dieu XL

Pick & Smile dispatches e-cargo bikes from the designated hub to the XL PUDO point on predefined short-distance routes. Insulated containers protect parcels, and cyclists follow safe cycling paths where available. Deliveries are registered in Pick & Smile's system, including timestamps, distance estimates, any routing deviations, and operational notes. These data support calculation of avoided van kilometers and emissions.

Zero-Emission Home Delivery

Home deliveries are operated from the Intermarché store to customers inside the agreed delivery zone. Pick & Smile riders follow time-window constraints and predefined cycle-safe routes. Parcels are transported in insulated containers to ensure product quality. Riders report deliveries electronically, capturing timing, distance, and customer feedback. This workflow tests the feasibility of integrating zero-emission delivery with grocery logistics.

Monitoring and Data Collection

Pick&Smile maintains daily operational monitoring for all three components of the pilot. Key data points include:

- QR-code scans and packaging circulation events
- Delivery timestamps, routing notes, distance estimates
- Rider-level observations on operational safety and constraints
- Customer acceptance indicators

- Operational disruptions or delays
- Environmental proxy indicators (avoided VKT, estimated emissions savings)

Data generated during the physical pilot feed continuously into the digital testing environment, where early operational evidence is used to calibrate models and explore larger-scale or alternative scenarios that cannot be tested physically. Physical and digital streams advance in parallel, informing each other throughout the pilot period.

Risk Management and Contingency Planning

The Lyon pilot uses a pragmatic and adaptive risk-management approach to ensure smooth operation and continuity throughout physical and digital testing. Risks are assessed prior to launch and monitored throughout implementation, with contingency measures prepared to address operational, technical and regulatory uncertainties.

Operational risks include delayed parcel inflow from partners, rider absences, bike or trailer malfunction, and temporary overload at the high-volume Part-Dieu XL point. To mitigate these, Pick&Smile maintains buffer packaging stock, provides technical checks for bikes and containers, and prepares fallback procedures such as temporary re-routing or manual parcel handling during peak hours.

Technical risks relate to QR code activation, data synchronization issues, and temporary unavailability of tracking dashboards. To address this, data export back-ups will be maintained, simplified manual logs can be used in short outages, and staff will receive step-by-step instructions for troubleshooting common issues.

Behavioral and uptake-related risks stem from uncertainty about customer willingness to adopt reusable packaging or green delivery options. Clear, simple communication at PUDO points and a user-friendly QR process will aim to limit friction. Moreover, alternative message framings and nudge variants will be prepared in case initial performance is below expected levels.

Regulatory and urban-environment risks include temporary mobility restrictions, event-related congestion, or unforeseen access limitations in delivery zones. Delivery plans incorporate time-window flexibility, safe routing alternatives, and continuous monitoring of municipal updates affecting the Part-Dieu area and home-delivery districts.

Overall, the operational setup is designed to remain flexible and modular, allowing the pilot to adapt to real-world fluctuations while maintaining data integrity and service continuity.

3.4.7 Implementation steps and processes

The operational implementation of the Lyon pilot is structured around a sequenced, iterative process that ensures smooth deployment of reusable packaging, e-cargo-bike distribution, and zero-emission home deliveries. The approach combines physical operations with digital simulation activities, allowing Pick&Smile and project partners to refine the operational model and evaluate its environmental, behavioral, and logistical performance. The steps below outline how the pilot moves from preparation to execution and continuous improvement.

Pre-pilot Phase: Testing and validation

The pre-pilot phase ensures that all physical components, digital tools, and partner processes are ready before live operations begin.

Activities include:

- **Reusable packaging validation and integration:** Pick&Smile procures the reusable packaging units and establishes the procedures for their activation at PUDO points. Internal testing verifies the clarity of QR codes, label resistance, and the reliability of the tracking workflow before the packaging is introduced to customers.
- **E-cargo-bike testing and equipment checks:** The newly procured e-cargo bikes and insulated containers undergo initial test rides in the delivery zones around Part-Dieu. Trials confirm safe handling, load stability, battery autonomy, and maneuverability in dense urban areas.
- **Operational rehearsal of flows:** Dry-runs simulate the two delivery paths: (1) feeder deliveries to the Part-Dieu XL point and (2) home deliveries from the Intermarché site. These rehearsals verify route feasibility, loading procedures, stopping points, and expected time windows.
- **Digital and behavioral preparation:** Pick&Smile configures simple monitoring sheets and data-logging procedures that capture packaging activation, reuse cycles, delivery completion, and rider observations. Behavioral personas and on-site nudges (short messages encouraging adoption and reuse) are refined and positioned for field use.

The purpose of this phase is to validate all technical and procedural elements, ensuring that the transition into live operations is structured, predictable, and aligned with urban constraints in Lyon.

Set-up Phase: Infrastructure and Workflow Deployment

Once the components and flows are validated, the set-up phase establishes the infrastructure and operational routines for the live pilot.

Key actions include:

- **PUDO-level preparation for reusable packaging:** Pick&Smile equips the Part-Dieu XL point with stock of reusable packaging, signage explaining usage, QR-code scanning instructions, and storage capacity for returned units. Staff are briefed on distribution, explanation to customers, and handling of returned packaging.

- **E-cargo-bike operational readiness:** Parking, charging, and overnight storage arrangements are confirmed. Tools, spare batteries (if applicable), safety gear, and load-securing equipment are inspected and assigned to designated riders.
- **Coordination with Intermarché:** Delivery windows, loading procedures, product categories, and expected demand profiles are agreed. A simplified handover routine is established to reduce waiting times and maintain reliability of the home-delivery cycle.
- **Definition of delivery zones and routing routines:** Pick&Smile finalizes the zone boundaries for the feeder deliveries (from hub to Part-Dieu XL) and the operational map for home deliveries. Routing assumptions are documented. For example: preferred cycling corridors, areas with heavy pedestrian traffic, and alternative pathway options in case of obstruction or weather constraints.

By the end of the set-up phase, all physical and organizational structures required for the pilot are in place.

Pilot Execution: Live Operations for Reusable Packaging, Feeder Deliveries, and Home Deliveries

The live pilot integrates the three operational components and provides data for evaluating feasibility, environmental performance, and customer acceptance.

a) Reusable packaging workflow

- Customers at the Part-Dieu XL point are offered reusable packaging for Vinted shipments.
- Staff provide brief guidance and encourage scanning of the QR code to activate the packaging in the system.
- Packaging is subsequently tracked when returned by customers or when re-used at later stages.
- Pick&Smile logs packaging circulation data daily.

b) E-cargo-bike feeder deliveries to the PUDO

- E-cargo bikes depart from the partner carrier hub with consolidated parcels destined for the XL point.
- Parcels are transported along predefined safe cycling routes and unloaded at the Part-Dieu location.

- Pick&Smile registers receipt of parcels and captures basic operational data (arrival time, volume, incidents).

c) Zero-emission home delivery from Intermarché

- Riders collect groceries and selected items from the Intermarché store according to scheduled windows.
- Deliveries are executed along short, dense routes covering nearby districts where e-cargo bikes offer the highest time and emissions advantage.
- Customer feedback or informal rider observations (e.g., ease of access, building entry constraints) are documented daily.

Across all flows, Pick&Smile ensures adherence to safety rules, delivery reliability, and consistent communication with partners.

Continuous Evaluation and Adjustment

The implementation is accompanied by ongoing evaluation and operational fine-tuning. This step integrates both physical observations and digital simulation insights.

Key elements:

- **Daily operational monitoring:** Data on packaging uptake, return rates, delivery completion, delays, route deviations, and bike performance are compiled by Pick & Smile.
- **Mid-term adjustment:** Based on accumulated performance data, adjustments may address:
  - stock levels of reusable packaging
  - number of daily feeder trips,
  - delivery-zone boundaries,
  - positioning of nudges or signage, etc.
- **Iterative interaction with digital simulations:** Digital testing runs in parallel. As soon as physical data become available (from the first weeks onwards), they are fed into the simulation models to assess how operations would perform under alternative assumptions, such as higher packaging adoption or expanded delivery zones.
- **End-of-pilot consolidation:** Physical and digital findings are integrated to evaluate operational feasibility, environmental performance, customer response, and the potential for broader deployment across Lyon.

This continuous loop supports a pragmatic, flexible, and evidence-based implementation.

3.4.8 Testing and validation approach

The Lyon pilot will undergo a structured testing and validation process to ensure that both the reusable-packaging workflow and the zero-emission delivery model function reliably before full deployment. The procedures will verify that Pick&Smile's operational setup, the e-cargo bike platform, and the associated data-collection tools meet the pilot's requirements under real operating conditions. The validation assesses technical feasibility, user interaction, data availability, and operational performance, thereby reducing risks and ensuring smooth transition into live testing.

Testing Environment and Scope

Validation activities take place around the Pick&Smile XL point in Westfield Part-Dieu and in selected delivery zones within Lyon. These areas reflect the conditions of the pilot: high throughput of parcels, diverse customer profiles, and dense traffic conditions. The testing scope covers two components:

- Reusable-packaging workflow testing. Reusable parcel packaging (procured and managed by Pick & Smile) is introduced in a controlled environment at the XL point. Tests verify:
    - correct stocking, display, and distribution of packaging to customers,
    - QR-code functionality, scalability, and linkage to the Pick & Smile tracking interface,
    - data exchange with Vinted Go (identification of parcels entering/exiting the Vinted Go flow),
    - correct return procedures and packaging condition checks.

This stage verifies that packaging circulation, customer interaction, and data logging operate as intended before scaling to full volumes.

- E-cargo bike delivery testing (feeder to home delivery). Pick&Smile's newly procured e-cargo bikes and insulated containers will undergo operational validation across representative routes, including:
    - feeder deliveries from the Vinted consolidation hub to the XL point,
    - home deliveries from Intermarché within predefined zones.

Testing assesses vehicle range, container usability, loading procedures, braking performance under load, and rider workflow. Routes will be selected to reflect typical speed limits, gradients, stop-and-go patterns, and micro-mobility infrastructure available in Lyon.

Digital Validation and Performance Tracking

Digital preparation focuses on ensuring that the monitoring tools accompanying the physical pilot reliably support the required KPIs and remain consistent with Pick & Smile's existing digital architecture. The validation activities are built around Pick & Smile's integrated operational platform (SMIL), complemented by the company's internal Data Lake, which together manage and store data related to parcel flows, routes and delivery operations.

Rather than introducing new orchestration systems, the validation verifies:

- consistency and completeness of data collection through the SMIL platform and the underlying Pick & Smile Data Lake,
- correct registration of reusable-packaging activation and return events, recorded at PUDO points by Pick & Smile staff as part of standard operating procedures,
- accurate logging of e-cargo bike tours, including distances, delivery times, load factors and operational events,
- reliable extraction of data from SMIL and the Data Lake into reporting spreadsheets and monitoring templates used for KPI calculation.

Test scenarios simulate the full pilot workflow, including reusable packaging activation at PUDO points, parcel handovers, feeder deliveries and home deliveries, to confirm that all required data fields are captured consistently within Pick & Smile's systems and can be exported in a structured form for analysis and reporting.

Data Collection and Feedback Integration

Throughout the testing phase, operational and behavioral data are collected to confirm that all processes function as intended. This includes:

- timestamps for deliveries and packaging scans,
- vehicle kilometers travelled (VKT) and route efficiency,
- packaging distribution and return rates,
- rider observations on bike handling and container usability,
- staff feedback from P&S locations regarding customer interaction and workflow complexity.

Customer-facing nudges and signage will also be validated to ensure clarity and ease of use. Feedback from Pick&Smile staff, riders, and early customers will be used to refine instructions, adjust packaging placement, and optimize handling procedures.

All personal data and parcel identifiers will be processed in line with Pick&Smile's internal data-protection standards, ensuring anonymization before export or reporting.

3.4.9 Expected challenges and risk mitigation

The Lyon pilot introduces two major innovations into Pick & Smile's daily operations: (i) reusable packaging integrated into the Vinted Go flow, and (ii) zero-emission deliveries using e-cargo bikes for feeder distribution and home delivery. These components create organizational, behavioral, and technological challenges that must be anticipated. The following section presents the primary risks expected during pilot deployment and outlines mitigation strategies to ensure smooth execution and reliable data collection within Lyon's regulatory and operational environment.

Adoption and Correct Use of Reusable Packaging

Challenge: Reusable packaging represents a behavioral change for both customers and staff. Incorrect activation of QR codes, non-returned packaging, and inconsistent use of the correct workflow at P&S points could limit data quality and distort return-rate metrics. Customer unfamiliarity or reluctance may reduce uptake, especially in the early months.

Mitigation: Pick&Smile will introduce clear in-store signage, simplified step-by-step instructions, and verbal explanations by staff during peak hours. A brief staff training module will ensure uniform handling procedures. Messages emphasizing convenience and environmental benefits will support behavioral adoption. Daily logs and weekly cross-checks will ensure data reliability, while anonymized API-based integration will allow tracing gaps or anomalies.

Operational Performance of E-Cargo Bikes

Challenge: The K-Ryole utility bikes and insulated trailers have specific technical constraints, including speed limits, battery autonomy fluctuations, and capacity limitations. Lyon's dense urban layout and mixed cycling infrastructure may affect average speeds and delivery times. Weather conditions can further reduce range or rider comfort.

Mitigation: Pick&Smile will conduct short test routes prior to launch to validate vehicle autonomy and optimal loading patterns. Daily equipment inspections and scheduled maintenance will limit breakdown risks. Riders will receive targeted training in maneuvering with trailers and navigating Lyon's cycling network. Buffer times will be included in route planning, especially for home-delivery runs.

Routing Efficiency and Delivery Reliability

Challenge: E-cargo bike operations depend heavily on local street conditions. Lyon's central districts include pedestrian zones, construction areas, and temporary restrictions (e.g., Crit'Air emergency ZPA measures). Such disruptions may affect delivery times to the Part-Dieu XL point and home-delivery customers.

Mitigation: Route planning will prioritize known cycling corridors with stable conditions. Riders will report disruptions through simple internal channels so that alternative routes can be updated periodically. Schedules will include safety margins for delivery windows. Pick&Smile will monitor traffic and policy updates, especially the expansion of ZFE and ZTL areas, to anticipate necessary adjustments.

Coordination with Intermarché for Home Deliveries

Challenge: The home-delivery component introduces operational interdependencies between Pick&Smile riders and Intermarché store workflows (order picking, cold-chain timing, and handover of insulated containers). Misalignment may affect freshness-sensitive goods and disrupt expected delivery slots.

Mitigation: A standard operating procedure (SOP) will be agreed in advance defining: preparation timing, handover checkpoints, loading procedures, and emergency contacts. Early test runs will synchronize Intermarché's picking cycles with departure times. Pick&Smile riders will use insulated containers suitable for food logistics, with pre-departure checks on seals and temperature conditions.

Digital Tracking and Data Quality

Challenge: Reliable measurement of KPIs depends on correct data capture from multiple sources: QR-code scans, parcel movements, Vinted Go interface data, rider logs, and TMS information. Inconsistent scanning or incomplete entries could compromise environmental and economic KPI accuracy.

Mitigation: Pick&Smile will perform weekly data-consistency reviews across the TMS, QR databases, and Vinted Go interfaces. Simple checklists will ensure riders and staff consistently scan both reusable packaging and delivery events. API exports will be used to analyze missing entries, and corrective actions will be applied promptly.

Customer Uptake and Behavioral Risks

Challenge: Even with high footfall at the Part-Dieu XL point, customer willingness to adopt reusable packaging or accept e-bike delivery timeframes may vary. Low uptake could limit the representativeness of behavioral KPIs.

Mitigation: Communication will emphasize ease, environmental benefits, and the novelty of participating in an EU-funded sustainability pilot. Simple nudges (e.g. default placement of reusable packaging at the counter, visible signage, and "you can reuse this several times" cues) will be used. Staff will encourage participation during high-traffic hours.

Weather, Seasonality, and Operational Continuity

Challenge: Heavy rain, cold temperatures, and winter peak seasons may reduce rider performance, prolong delivery times, or temporarily disrupt e-bike operations.

Mitigation: Pick&Smile will establish contingency protocols, including temporary re-routing, additional buffer times, and protective equipment for riders. Critical deliveries may be shifted in time when severe weather warnings are issued. Data logs will record weather conditions to contextualize performance results.

Regulatory and Policy Updates in Lyon

Challenge: The Lyon metropolitan area continues to expand low-emission policies (ZFE, emergency ZPA, upcoming ZTL in Presqu'île). These changes may affect routing and access conditions.

Mitigation: Pick & Smile will monitor city communications and use the Logistics Orientation Document and mobility planning updates as guiding references. The e-cargo bike model already aligns well with future mobility policies, reducing regulatory risk. Nevertheless, periodic reviews will ensure compliance with new rules.

The challenges identified for the Lyon pilot reflect the interplay between behavioral innovation (reusable packaging), technological adoption (e-cargo bikes), and coordination across partners (Intermarché, Vinted Go). By applying targeted mitigation strategies and maintaining close monitoring, the pilot will remain operationally resilient and capable of delivering high-quality evidence for sustainability impacts in a real-world metropolitan context.

3.5 Poznań pilot / GreenRoute (Urban Logistics Simulation Model)

3.5.1 Description of the pilot

The Poznań pilot complements the operational activities conducted in the Lyon pilot, where the Pick&Smile concept is implemented and tested in a real-life environment. While the Lyon pilot provides empirical evidence regarding operational feasibility and user interaction with the staffed PUDO model, the Poznań pilot focuses on analyzing how the Pick&Smile concept and related consolidation approaches could be adapted to the Polish logistics market. Through simulation-based modelling and behavioral analysis, the pilot explores the operational, economic and consumer conditions required for the potential expansion of the Pick&Smile concept beyond its initial implementation context.

The Urban Logistics Simulation Model, extension of the Poznań pilot, builds directly upon the operational concept previously defined for Pick&Smile (D3.2). While the initial pilot description focused on the real-life deployment of a staffed PUDO hub supported by electric vans, cargo bikes and reusable packaging, the current phase expands this approach through advanced modelling and scenario analysis. Rather than replacing the physical concept, the digital pilot deepens its analytical dimension, enabling systematic evaluation of scalability, behavioural uptake and environmental/economic trade-offs within the Polish market context. In this way, the Poznań pilot evolves from an operational testbed into a comprehensive decision-support framework, strengthening both business model validation and policy relevance.
The Poznań pilot within GreenTurn will be implemented as a digital, model-based intervention developed in the form of an Urban Logistics Simulation Model. Unlike other pilots relying on physical infrastructure deployment or real-life operational testing, the Poznań intervention focuses on building a data-driven simulation model that reproduces the functioning of the last-mile logistics system in the central urban area of the city.

The pilot is designed as an advanced analytical and decision-support environment rather than a physical implementation. Its purpose is to simulate how different elements of the urban logistics ecosystem interact and to assess the consequences of alternative organisational and infrastructural configurations before any real-world investment decisions are taken.

The Simulation Model will be capable of:

- replicating the complete parcel flow within the urban delivery ecosystem, including both deliveries and returns,
- testing alternative operational and infrastructural configurations,
- optimising vehicle allocation and routing logic,
- assessing environmental and economic performance simultaneously,
- modelling customer response to eco-delivery options and linking it to operational outcomes.

Table 29. Overview of the GreenRoute Pilot

Basic information	Description
Title of the Pilot	GreenRoute
Region - Country	Poznań, Poland
Participants	Łukasiewicz – Poznański Instytut Technologiczny (LPIT – pilot coordination and modelling); Pick & Smile (GreenTurn partner, logistics service provider and PUDO operator); City of Poznań (urban mobility and logistics policy stakeholder); Consumers participating in behavioural testing
Type of pilot	Simulation-based urban logistics pilot analysing B2C parcel delivery flows, microhub/PUDO operations and behavioural adoption of sustainable delivery options
Short description	Development of an Urban Logistics Simulation Model to evaluate sustainable last-mile delivery configurations in Poznań, including cargo-bike deployment, microhub/PUDO integration and reusable packaging circulation. The pilot analyses environmental, operational and economic impacts of different delivery system configurations and assesses the potential transferability of Pick&Smile-inspired solutions to the Polish logistics market

Instead of analysing single components in isolation, such as vehicle electrification alone, the model will capture systemic interactions between demand structure, vehicle allocation, microhub usage, consolidation processes and customer behaviour. This holistic perspective is particularly important in dense urban areas where operational adjustments may significantly affect congestion, emissions and service efficiency.

The Simulation Model will be built using:

- anonymised operational data from a logistics service provider, including parcel volumes, route density and indicative cost structure,
- spatial datasets describing delivery zones, mixed land use and restricted-access areas,
- regulatory and policy parameters reflecting current and potential mobility measures,
- emission factors and operational cost indicators for different vehicle types.

The pilot will focus on the central urban area of Poznań (Figure 18), characterised by:

- high delivery density,
- mixed residential and commercial functions,
- limited street capacity and pressure on public space,
- potential Clean Transport Zone regulations,
- areas with restricted access for conventional vehicles.

Within the simulation framework, particular attention will be given to the role of the microhub. The model will analyse a configuration in which the microhub functions primarily as a consolidation and cross-docking facility for a single operator, while also potentially serving as a Pick-Up and Drop-Off (PUDO) point for customers. This dual-function concept will allow the pilot to assess how partial replacement of door-to-door deliveries with hub-based collection influences vehicle kilometres travelled, route structure, operational cost and emission performance.

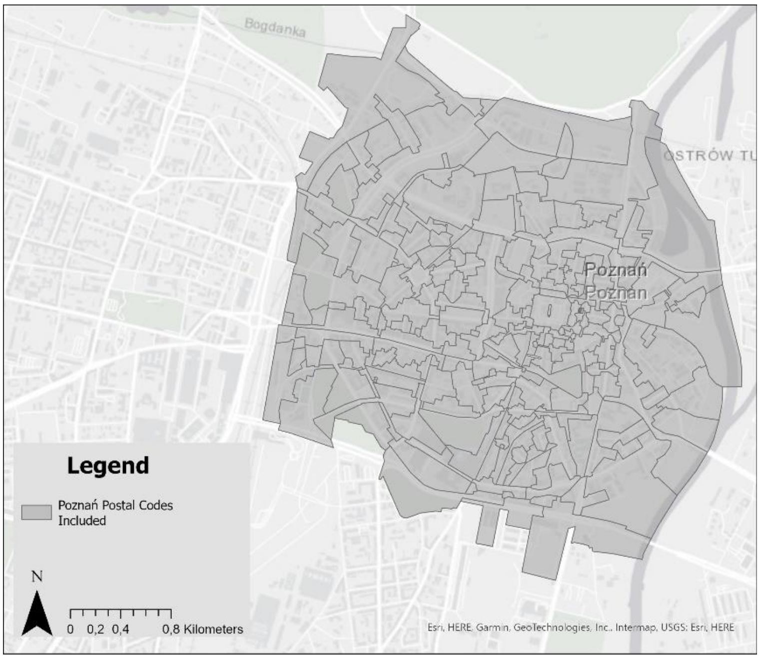

Figure 18. Spatial Coverage of the Poznań Pilot

Importantly, this component of the pilot will also serve to examine to what extent the Pick&Smile staffed PUDO model successfully implemented in Lyon can be effectively transferred and scaled in the Poznań context. By simulating customer adoption, operational dynamics and cost/emission trade-offs, the Simulation Model will provide evidence on whether the Lyon-based PUDO and consolidation logic remains viable in a more price-sensitive and structurally different Polish market environment.

The digital approach makes it possible to test configurations that would be operationally complex or financially risky in real-life conditions. These include:

- reconfiguration of delivery rounds based on dynamic cargo bike prioritisation,
- integration of a microhub with PUDO functionality within a single-operator structure,
- introduction of reusable packaging circulation,
- modelling of behavioural shifts triggered by eco-delivery incentives.

By analysing these scenarios in a controlled simulation environment, the pilot reduces implementation risk while generating robust evidence to support future strategic decisions regarding sustainable urban logistics in Poznań.

3.5.2 Main elements of the Poznań pilot

The Poznań pilot is built as a single, coherent modelling framework composed of five tightly interconnected components (Figure 19). These elements do not function independently; instead, they form layers of one integrated Simulation Model that mirrors how the last-mile logistics system actually behaves in a dense urban environment.

Rather than focusing on one intervention, such as electrification or microhub deployment, the pilot combines operational modelling, optimisation logic, infrastructure configuration, circular economy integration and behavioural analysis into one structured analytical environment.

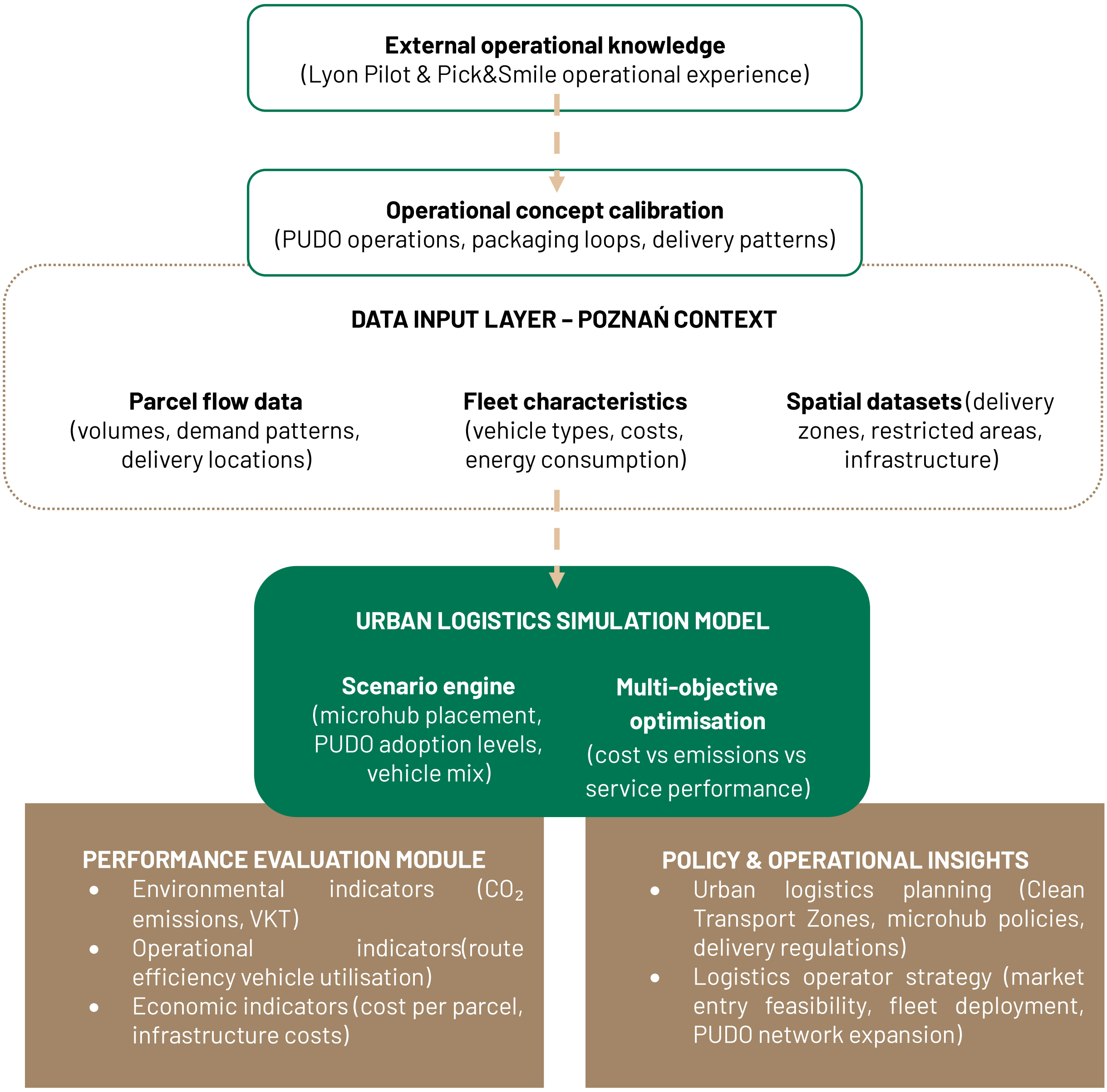

Figure 19. Architecture of the Urban Logistics Simulation Model under GreenRoute pilot

1. Full parcel flow modelling

At the core of the Simulation Model lies a comprehensive representation of parcel flows. The model does not treat deliveries as isolated routes but as part of a dynamic, overlapping system where different shipment types compete for vehicle capacity and operational time.

The simulation includes:

- small and medium sized parcels,
- large shipments exceeding 30 kg,
- B2C deliveries,
- individual customer pick-ups,
- e-commerce returns,
- inbound and outbound flows via the microhub.

Forward and reverse logistics are modelled together. This is particularly important because return flows, re-deliveries and pick-ups influence route structure, stop density and vehicle load factors. By modelling deliveries and returns in isolation, one would risk underestimating vehicle kilometres travelled and labour intensity. The Simulation Model therefore reflects real operational dynamics, where vehicles often carry a mix of deliveries and collections within a single round.

This systemic representation enables the model to capture how changes in one element, for example, shifting part of deliveries to a microhub, propagate through the entire logistics chain.

2. Multi-criteria vehicle allocation algorithm

A second foundational element of the pilot is the multi-criteria optimisation algorithm responsible for allocating parcels to vehicles. In practice, this algorithm functions as the "decision engine" of the Simulation Model.

The model includes three vehicle categories:

- electric cargo bikes,
- electric vans,
- diesel vans (reference scenario for benchmarking).

Each parcel is assigned to a vehicle type based on a structured set of input parameters:

- parcel weight and dimensions,
- spatial delivery density,
- presence of restricted traffic zones,
- distance from the microhub,
- vehicle availability,
- route load factor (capacity utilisation),
- operational cost per vehicle,

- unit CO_2 emissions,
- service level requirements

The decision logic follows a priority hierarchy that reflects both sustainability and operational realism:

- **Cargo bikes** are prioritised in dense central zones, especially where access restrictions apply and parcel size remains within defined thresholds.
- **Electric vans** are assigned to larger parcels, medium-density routes or grouped pick-up operations where higher load capacity is required.
- **Diesel vans** remain as a fallback reference scenario to ensure robustness and allow comparison with conventional delivery structures.

Importantly, the optimisation process does not minimise emissions alone or cost alone. Instead, it balances multiple objectives simultaneously, allowing identification of configurations that are environmentally effective without becoming economically unrealistic.

3. Microhub as dual-function node

The microhub plays a central role in the simulation and is modelled as more than a technical transhipment facility. Within the Simulation Model, it performs two interconnected functions:

- a cross-docking and sorting node for operator consolidation,
- a Pick-Up and Drop-Off (PUDO) point for customers of the same operator.

In operational terms, this dual functionality allows the model to simulate partial replacement of door-to-door deliveries with hub-based collection. The introduction of PUDO changes not only where parcels are handed over but also how routes are structured.

The model assesses how this shift influences:

- number of delivery stops,
- route saturation and density,
- vehicle kilometres travelled,
- fleet composition (cargo bikes vs vans),
- labour intensity and working time distribution.

By simulating different customer adoption levels of PUDO, the Simulation Model can quantify under which conditions hub-based collection improves both emission performance and operational efficiency.

4. Reusable packaging integration

Another key layer of the pilot is the integration of reusable packaging within the logistics ecosystem. Instead of treating packaging as an external issue, the Simulation Model embeds it directly into route and capacity calculations.

The model simulates:

- introduction of reusable packaging into parcel flows,
- collection of empty packaging at delivery,
- collection during return pick-up,
- drop-off of packaging at PUDO,
- consolidation of packaging at the microhub,
- transport back to the distribution centre.

This approach allows assessment of how circular economy principles interact with vehicle load factors, route efficiency and emission performance. For example, additional packaging weight may influence the feasibility of cargo bike deployment, while consolidated packaging returns may improve reverse logistics efficiency. By modelling packaging circulation as part of the operational system, the pilot bridges environmental sustainability and logistics planning.

5. Behavioural layer

The behavioural component of the Poznań pilot focuses on understanding how customers perceive and evaluate eco-delivery options when making purchasing decisions. The aim is to explore whether sustainability considerations can realistically lower-emission alternative. Rather than assuming that customers automatically prefer sustainable solutions, the pilot will examine:

- how eco-delivery is understood,
- what level of information is meaningful,
- whether environmental transparency influences choice,
- how sensitive customers are to price differences,
- whether small incentives increase adoption.

Interface mock-ups

To test real decision-making behaviour, simulated checkout environments will be prepared for:

- retailer or marketplace checkout pages,
- logistics operator applications.

These mock-ups will resemble standard e-commerce interfaces, ensuring that customers evaluate delivery options in a realistic purchasing context.

Elements presented to customers

Different interface variants will present eco-delivery options in varying ways, including:

- a clearly labelled "Eco delivery" alternative,
- information on estimated CO_2 emissions,
- comparison between standard and eco delivery impact,
- small financial incentives (e.g. symbolic discount),

- loyalty points,
- visual sustainability indicators such as a "green choice" label.

The objective is to analyse how framing, visibility and incentives shape perception and trust in the eco-delivery option.

Research methodology

Customer perception and behaviour will be examined using:

- A/B testing of different interface designs,
- structured surveys assessing attitudes towards sustainable delivery,
- behavioural experiments testing framing effects,
- price sensitivity analysis to determine acceptable cost differences.

The analysis will aim to identify:

- the share of customers willing to choose eco-delivery,
- the influence of incentives versus environmental awareness,
- potential psychological barriers (e.g. perceived delay, distrust, inconvenience).

By focusing on customer perception, this component of the pilot provides insight into whether sustainable urban logistics can be supported not only by infrastructure and regulation, but also by voluntary behavioural change at the point of purchase.

The integrated simulation of components 1–5 serves as a structured transferability and scalability assessment of the Pick&Smile model. By analysing operational performance, customer adoption, reusable packaging integration and cost/emission trade-offs under Polish market conditions, the pilot evaluates whether the Lyon-based PUDO, zero-emission logistics and circular packaging logic can be effectively transferred to Poznań and scaled within a more price-sensitive and structurally different urban environment.

3.5.3 Description and evaluation of pilot scenarios

The scenario analysis within the Poznań pilot begins from a clearly defined and realistic reference point. Before introducing any innovation, the Simulation Model first reconstructs how the system functions today under conventional conditions. This baseline scenario serves as the analytical anchor against which all alternative configurations are compared.

Baseline scenario

In the baseline configuration:

- deliveries are carried out predominantly by vans,
- distribution follows a door-to-door model,
- no microhub consolidation is applied,
- no behavioural incentives influence delivery choice,
- no reusable packaging is introduced.

This scenario reflects a standard urban parcel delivery structure, where routes are shaped primarily by delivery density and operational convenience. It establishes reference values for:

- total and per-parcel CO_2 emissions,
- vehicle kilometres travelled,
- fleet utilisation,
- labour intensity,
- operational cost per parcel.

By stabilising these parameters, the baseline provides a transparent benchmark for assessing the added value or trade-offs introduced by more sustainable configurations.

From this starting point, the Simulation Model progressively introduces structural changes to observe how the system responds. Instead of testing isolated variables, the pilot evaluates structured scenario groups, each targeting a different dimension of the logistics ecosystem.

Alternative scenario groups

The model explores combinations of the following scenario dimensions:

1. Fleet composition variations

- Increased cargo bike share in dense central zones.
- Fully electric fleet scenario (cargo bikes + electric vans).
- Mixed fleet configuration with diesel as fallback.

These scenarios test how electrification and cargo bike prioritisation influence route structure, emission performance and operational cost.

2. Microhub and PUDO adoption

- Ex. 10%, 25% customer adoption of hub-based collection.
- Pick-up only vs pick-up combined with parcel drop-off.
- Standard vs extended microhub operating hours.

Here, the model examines how shifting part of deliveries from door-to-door to a hub-based model influence stop density, vehicle kilometres travelled and fleet allocation.

3. Circular packaging adoption

- Ex. 20%, 30% adoption of reusable packaging.
- Integrated collection during deliveries vs dedicated collection rounds.

These scenarios assess how circularity influences load factors, route planning and emission performance.

Each scenario or combination of scenarios is evaluated using a structured set of performance indicators:

- total and per-parcel CO_2 emissions,
- vehicle kilometres travelled,
- fleet utilisation rate,
- microhub occupancy level,
- labour intensity (working time per parcel),
- operational cost per parcel,
- cost of emission reduction (€/kg CO_2).

Rather than optimising a single variable, the pilot applies a multi-objective optimisation framework to identify Pareto-efficient solutions. This means that selected configurations represent balanced trade-offs between environmental gains and economic feasibility, avoiding solutions that are environmentally optimal but financially unrealistic.

3.5.4 Description of most promising pilot scenario

Preliminary modelling suggests that the most promising configuration does not rely on a single intervention but on a carefully combined set of adjustments.

This scenario includes (see Table 30):

- prioritised cargo bike deployment in high-density central areas,
- 25% customer adoption of PUDO,
- moderate introduction of reusable packaging,
- extended microhub operating hours,
- increased utilisation of cargo bikes within the operator's fleet.

In this configuration, the system begins to reorganise itself around consolidation and density. As more parcels are redirected to the microhub and cargo bikes serve the most saturated urban areas, van traffic in the central zone decreases significantly. The number of door-to-door stops is reduced, routes become more compact and infrastructure is used more intensively.

Table 30. Scenario structure of the Poznań pilot

Scenario group	Parameter tested	Example configurations
Fleet configuration	share of ZE vehicles	diesel baseline / mixed / electric
Cargo-bike deployment	routing priority	none / centre priority
Microhub / PUDO	% of parcels	10% / 25%
Circular packaging	reuse rate	10–30%
Combined system	integrated scenario	ZE + PUDO + microhub

Importantly, this scenario does not eliminate operational constraints or costs, but it demonstrates that a balanced combination of infrastructure use, behavioural shift and targeted electrification can deliver meaningful emission reductions without disproportionate financial burden.

The identified configuration therefore represents a realistic compromise between sustainability ambition and operational feasibility, offering a scalable pathway for future implementation in Poznań.

The findings generated by the Poznań pilot will complement the operational insights obtained in the Lyon pilot and provide evidence supporting potential strategic decisions regarding the expansion of the Pick&Smile concept into the Polish logistics market.

3.5.5. Alignment of pilot with local SUMPs/SULPs

The Poznań Digital Pilot is aligned with the objectives of the Sustainable Urban Mobility Plan (SUMP) for the City of Poznań and the Sustainable Urban Mobility Plan for the Poznań Metropolis. Both strategic documents emphasise the need to develop a safe, efficient and environmentally sustainable urban mobility system while improving the quality of life of residents and reducing the negative environmental impacts of transport (Kozak et al., 2021; TRAKO PROJEKTY TRANSPORTOWE, 2021).

Although implemented as a digital intervention, the pilot contributes directly to these objectives by analysing logistics solutions that support the transition towards more sustainable urban freight transport. In particular, the Simulation Model evaluates the potential effects of introducing zero- and low-emission delivery vehicles, improved consolidation of urban freight flows and more efficient organisation of last-mile logistics operations in dense urban areas.

These elements correspond with the strategic directions of Poznań's mobility policy, which promotes reducing the environmental impacts of transport, limiting congestion and improving the efficiency of the urban transport system through better traffic management and the use of modern technologies. The pilot therefore supports the city's broader ambition of developing environmentally friendly mobility solutions and reducing transport-related emissions. The alignment between the pilot features and the local mobility policy objectives is summarized in Table 31.

Table 31. Alignment of GreenRoute Pilot features with local mobility policies

Policy Objective / Action	SUMP or SULP	Addressed by Poznań Pilot
Reduce environmental impacts of transport	SUMP / Metropolitan SUMP	Simulation of zero- and low-emission delivery vehicle deployment
Improve efficiency of urban mobility systems	SUMP	Modelling optimisation of delivery routes and logistics operations
Support development of sustainable mobility solutions	SUMP / Development Strategy	Evaluation of cargo bikes, electric vans and alternative delivery configurations

Policy Objective / Action	SUMP or SULP	Addressed by Poznań Pilot
Improve organisation of urban freight transport	SULP / Metropolitan SUMP	Simulation of microhub-based consolidation and PUDO-based parcel collection
Use modern technologies in mobility management	SUMP	Development of a digital Urban Logistics Simulation Model
Reduce congestion in dense urban areas	SUMP	Analysis of alternative logistics configurations reducing van traffic intensity
Promote behavioural change towards sustainable mobility	Development Strategy	Consumer behaviour analysis related to sustainable delivery options
Support data-driven mobility planning	SUMP	Scenario-based modelling providing quantitative evidence for policy development

The simulation of microhub-based consolidation and PUDO functionality reflects the growing importance of better urban freight organisation highlighted in the metropolitan mobility strategy. By analysing how consolidation points and alternative delivery modes could influence traffic intensity, route structures and emissions, the pilot provides analytical insights relevant for potential measures related to urban freight management and access regulation in the city centre.

The behavioural component of the pilot further complements the objectives of the city's development strategy, which emphasises the role of residents and users of the urban space in shaping sustainable mobility patterns. By examining consumer responses to sustainable delivery options, the pilot contributes to understanding how behavioural incentives and service design can support broader policy measures aimed at reducing the environmental footprint of urban transport.

Importantly, the Simulation Model generates quantitative evidence that can support future planning and policy discussions related to:

- improving the environmental performance of urban logistics.
- the potential role of consolidation hubs and PUDO networks in the urban freight system.
- the use of zero-emission delivery vehicles in dense urban areas.
- behavioural incentives supporting sustainable delivery choices.

Through scenario-based modelling and system analysis, the pilot contributes to strengthening the municipality's capacity to design data-driven urban logistics policies consistent with the long-term vision of Poznań as a green, well-connected and resident-oriented city.

3.5.6. Operational requirements

Although the Poznań pilot is implemented digitally, it relies on strong institutional cooperation and access to reliable operational data. The credibility and relevance of the Simulation Model depend on the quality and realism of the input parameters used for modelling.

Operational requirements include access to:

- anonymised parcel flow data (volumes, spatial distribution, temporal patterns),
- fleet characteristics and cost structure,
- emission factors for different vehicle types,
- spatial datasets describing delivery zones and restricted areas,
- modelling and optimisation expertise capable of developing and calibrating the Simulation Model.

To ensure compliance with data protection and commercial sensitivity, formal data-sharing agreements and anonymisation procedures will be applied. Aggregation of sensitive indicators will be used where necessary.

Close coordination between the municipality and the participating logistics operator is essential. This cooperation ensures that the model reflects actual operational constraints, such as working hours, service level requirements and vehicle availability. Operational insights derived from the Pick&Smile activities, including the Lyon pilot, will also support the definition of realistic operational parameters for consolidation hubs and PUDO-based delivery models. Without such coordination, the risk of unrealistic modelling assumptions would increase significantly.

3.5.7. Implementation steps and processes

The implementation of the Poznań Digital Pilot will follow a structured and sequential process, ensuring methodological transparency and stakeholder engagement.

The first phase will focus on data acquisition and harmonisation. Operational, spatial and cost-related datasets will be collected, cleaned and aligned into a coherent modelling structure. Particular attention will be given to ensuring consistency between parcel flow data and spatial representation of the urban area.

In the second phase, the Simulation Model architecture will be developed. This includes building the simulation environment, defining system boundaries and integrating emission and cost calculation modules.

The third phase will involve the integration of the multi-criteria optimisation algorithm responsible for vehicle allocation and routing logic.

In parallel, behavioural mock-ups will be developed and tested, generating empirically based parameters for eco-delivery adoption.

Subsequently, structured scenario simulations will be executed, including configurations inspired by operational concepts tested within the Pick&Smile framework. Comparative analysis will be conducted to assess environmental, operational and economic performance across configurations.
The final stages will include validation workshops with municipal representatives and the logistics operator, followed by preparation of policy-oriented and operational recommendations.

3.5.8. Testing and validation approach

To ensure robustness and reliability, the Simulation Model will undergo systematic validation.

First, the baseline scenario will be calibrated against historical delivery data. Key indicators such as vehicle kilometres travelled, delivery density and cost structure will be compared to real operational figures to verify consistency.

Second, the model outputs will be checked for internal coherence, particularly with regard to:

- vehicle kilometres travelled,
- cost per parcel,
- emission calculations.

Third, sensitivity analyses will be conducted to test how results change under varying assumptions, including:

- electricity emission factors,
- labour cost levels,
- customer adoption rates for eco-delivery.

Finally, stakeholder workshops will serve as an additional validation layer, allowing practitioners to review assumptions and assess operational realism, including practitioners involved in Pick&Smile operational activities. This combined quantitative and qualitative validation approach increases confidence in the model's applicability.

3.5.9. Expected challenges and risk mitigation

As with any data-driven modelling project, several risks and uncertainties must be acknowledged.

One of the primary challenges is limited access to detailed operational data due to commercial sensitivity. This risk will be mitigated through anonymisation, aggregation of sensitive indicators and formal data-sharing agreements.

Another uncertainty concerns behavioural adoption rates. Customer willingness to select eco-delivery may vary depending on incentive structure, price sensitivity or perception of convenience. To address this, the model will test multiple adoption scenarios rather than relying on a single assumption.

There is also a risk that optimisation processes could produce environmentally optimal but economically unrealistic solutions. This will be mitigated through the use of multi-objective optimisation, which explicitly balances cost and emission performance.
Finally, institutional coordination between municipal authorities and the logistics operator may present organisational challenges. Early stakeholder engagement, clearly defined roles and transparent communication processes will reduce this risk and ensure alignment between modelling outcomes and practical feasibility.

4. Conclusions

4.1 Overview of the deliverable

This deliverable translates the work of Task 3.2 into pilot-ready prototypes and Minimum Viable Products by presenting each pilot program as a clear business proposal and describing what the pilot program will test, what resources it needs, and how the partners will conduct the test in practice.

GreenTurn implements five pilot projects across its portfolio, covering different logistics flows and local conditions. Athens is targeting business-to-business distribution with electric vehicles, supported by route and time slot coordination. Zaragoza and Poznan focus on deliveries and returns between businesses and consumers, using consolidation mechanisms and mechanisms that target users and guide their choices. Vienna combines circular packaging processes in a logistics center with a low-emission mode of transport for the last mile. Lyon integrates reusable packaging with zero-emission distribution into parcel flows between consumers and grocery-related activities. Although each city follows its own path, the pilots converge on three recurring levers.

1) Reducing fragmentation through consolidation, using hubs, pickup points, or order grouping.
2) They shift transport to lower emission vehicles, such as electric vans, cargo bikes, or electric scooters.
3) They add an enabling layer that makes the change actionable day to day, either through an orchestration platform, a municipal platform with incentives, or scanning routines that support reuse.

The quality of implementation will determine whether pilot programs will produce useful data where effective operations depend on clear roles, simple procedures and consistent data collection, with teams recording events in a uniform manner and partners sharing data reliably.

4.2 Selected MVPs – selected pilots

This chapter brings the pilots together and highlights what they share, and where they differ. It helps the reader compare the selected Minimum Viable Product direction in each city using the same lens, namely flow type, operational levers, digital support, and the indicators that will confirm performance during implementation.

Across the portfolio, the pilots cover three flow types with Athens focusing on business-to-business distribution, Zaragoza and Poznan focusing on business-to-consumer deliveries and returns. Lyon adds a consumer-to-consumer component through parcel exchanges and reuse processes, while also including grocery delivery. Vienna focuses on a warehouse-based configuration and links packaging circularity to a low-emission mode of transport for the last mile.

Even with different flows, the pilots converge on a small set of levers. First, they all apply some form of consolidation, either by grouping orders before dispatch, by using pickup points, or by feeding parcels through hubs. Second, they shift mode toward lower emission vehicles, ranging from electric vans to electric cargo bikes and electric scooters. Third, they use a digital or behavioural layer that steers daily choices, either through an orchestration platform, a municipal platform with incentives, or reusable packaging routines that require scanning and returns. Table 32 summarizes the portfolio briefly.

Table 32. Pilot comparison table, flows, operational measures, vehicles and digital or behavioural support

Pilot	Flow	Core intervention	Vehicles	Digital or behavioural layer
Athens, ElectroSmart	B2B	Electrified distribution with route and slot coordination	Electric vans	Last mile orchestration platform
Zaragoza, Green Button	B2C	Micro consolidation in Central Market and low impact last mile	Cargo tricycles, walking	Municipal platform, incentives and gamification
Vienna, LogPoint	Parcel distribution	Circular packaging and low emission last mile	Electric scooters	Operational monitoring of packaging and deliveries
Lyon, SustainSwap	C2C and grocery	Reusable packaging with pickup point and cargo bike home delivery	Electric cargo bikes	Carrier scanning, tracking and return routines
Poznań, GreenRoute	C2C and B2C parcel flows	Simulation-based optimisation of zero-emission last-mile configurations (PUDO, microhubs, delivery routing)	Electric vans and cargo bikes (modelled scenarios)	Urban logistics simulation model with behavioural adoption scenarios for eco-delivery

4.3 Next steps

Following the prototypes and Minimum Viable Products documented in this deliverable, the project now shifts from design and refinement to structured implementation and evaluation across the five pilots. First, the consortium will apply a common pilot requirements framework that defines test environments, roles, timelines, and monitoring routines, so pilots run in a comparable way while still reflecting local constraints (Task 4.1). Next, partners will operationalize the selected solutions in physical pilots and iterate through testing loops, using real operational feedback to adjust implementation details and improve feasibility (Task 4.2). In parallel, the project will develop demand and transport models to support digital testing, which extends the evidence base by exploring scenarios and sensitivities that field trials cannot cover fully (WP4 objectives and D4.4 description). Building on these outputs, WP5 will consolidate learning across pilots, combine operational assessment with simulations and scenario work, and quantify environmental and social impacts, including forward looking cases that help interpret results beyond the pilot settings (Tasks 5.1 to 5.4). Finally, the project will translate validated evidence into practical uptake pathways, including scale up and implementation plans for logistics service providers, guidelines for retailers, capacity building for local authorities, and policy recommendations that support replication and longer-term adoption (WP6 objectives and Task 6.1).

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