DECARBOMILE

Decarbonise last mile logistics

D2.1 Implementation Roadmap

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Nature of the Deliverable		
R	Document, report	X
DEM	Demonstrator, pilot, prototype	
DATA	Data sets, microdata, etc.	
OTHER	Software, technical diagram, etc.	

Dissemination Level		
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CI	Classified information: RESTREINT UE (Commission Decision 2015/444/EC)	
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PROJECT SUMMARY

Logistics is at the core of modern society and essential to bring food and goods in the heart of cities, where a majority of Europeans live. However, there are a number of a challenges associated with transport efficiency in Europe and worldwide. Thus, significant changes are needed in supply chain operations, especially on the last-mile logistics chain. This lack of efficiency affects the economics of logistics and its externalities on the urban tissue, last-mile logistics representing 30% of the total emissions of logistics transportation.

The DECARBOMILE project is a comprehensive initiative aimed to minimize the negative impact of logistics by creating a more sustainable and environmentally friendly transportation system through introducing innovative solutions that encourage the use of alternative fuels and technologies, with the ultimate goal of reducing greenhouse gas emissions and combating climate change.

Gathering 31 partners from 10 different countries, DECARBOMILE aims to trigger an unprecedented improvement of the green last-mile logistics in Europe. To reach that goal, DECARBOMILE relies on a strong experience of decarbonising urban logistics through European initiatives such as CIVITAS. Partners will build upon all previous results to develop improved delivery methods, tools and methodologies, and implement them across Europe. The solutions developed in DECARBOMILE will demonstrate the full potential of decarbonised last-mile logistics.

Thus, the ***main objective of DECARBOMILE*** is to develop tailored solutions and demonstrate the full potential of decarbonised last-mile logistics in four living labs – Hamburg (Germany), Logroño (Spain), Nantes (France) and Istanbul (Turkey), and four satellites – Getafe (Spain), Tallinn (Estonia), Ghent (Belgium), Sarajevo (Bosnia and Herzegovina), in line with their technical, environmental and local socio-economic contexts.

The main objective is expressed in the six objectives listed below:

O1: Develop interoperable and multimodal vehicles for Last-mile Delivery (LMD) in urban contexts.
DECARBOMILE will work on logistics vehicles optimisation, especially regarding cargo-bikes and testing their combinations with transportation modes alternative to the road and conventional trucks (river, rail). Core focus will be: 1) the interoperability between solutions and adaptability to the local contexts on the hardware side and 2) innovative software enabling optimised vehicle loading and routing.

O2: Enhance collaborations between local and global stakeholders for long term successful uptake
DECARBOMILE will put a strong emphasis on the collaboration between local stakeholders and focus on piloting cooperation with private logistics operators and local businesses. DECARBOMILE will also collaborate with the CIVITAS and other relevant initiatives, in which several partners from the consortium are involved. DECARBOMILE will develop an urban consolidation model, allowing new functionalities to be tested and join the Digital hub for collaborative last-mile logistics.

O3: Optimise last-mile logistics planning and integration in the urban fabric by developing innovative ICT tools
The project will focus on the development of several digital tools to ensure optimised last-mile logistics, reducing the transportation time and associated traffic and GHG emissions, as well as costs. This will include the development of new tracking, tracing and monitoring tools to optimise the control over the flow of goods, network design and delivery optimisation. Emphasis will be put on the integrated approach of these tools and the development of a collaboration layer to assess their impact on the environmental and economic performance.

O4: Develop innovative tailored business models integrating social innovations for a strong market uptake

A key aspect of the project is to develop economic sustainability of the proposed solutions. DECARBOMILE will thus establish new models for addressing governance and management of logistics operations. This will include the integration of social innovations to ensure a larger acceptance of the solutions in the demonstration cities and for their replication across Europe.

O5: Demonstrate full potential green last-mile delivery in 4 living labs and investigate replication in 4 satellites

At the core of the demonstration, the four Living Labs will host full potential pilots. In addition, the four satellites will work on the pre-testing of specific developed solutions before their full-scale implementation in the living labs, and on their adaptability and replicability to particular contexts.

O6: Integrate the LML concepts in the local public policy plans and European regulations

Last-mile logistics faces specific regulatory and social contexts potentially impacting its implementation and limiting its spread. DECARBOMILE will propose recommendations on the implementation and improvements of last-mile delivery. To ensure a strong uptake of zero-emission efficient last-mile solutions, DECARBOMILE will integrate urban strategy co-creation, including traffic regulation, urban planning, and space management, with citizens in collaboration with local policymakers.

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More information on the project can be found at https://www.decarbomile.eu

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GLOSSARY

Abbreviation	Description
BID	Business Improvement District
CAPIT	Capillar IT
CBS	Copenhagen Business School
CCI	Chamber of Commerce and Industry
DSS	Decision Support System
FLEX	FlexiModal
GA	Grant Agreement
GGI	Genegis GI
GHG	Green House Gases
HAM	Hamburg Living Lab
HORECA	HOtel REstaurants CAtering
HPA	Hamburg Port Authority
ICE	Internal Combustion Engines
ICT	Information and Communication Technology
IoT	Internet of Things
IMM	Istanbul Metropolitan Municipality
IMT or IMTA	Institut Mines-Télécom
IST	Istanbul Living Lab
IW-NET	Inland Waterways NETwork
KOM	Kick-Off Meeting
LEZ	Low Emission Zone
LGN	Logroño Living Lab
LIHH	Logistics-Initiative Hamburg
LL	Living Lab
LMD	Last Mile Delivery
LML	Last Mile Logistics
LU	Logistic Unit
MCC	Micro-Consolidation Centre
NANTES	Nantes Living Lab
NGS	New Generation Sensors
OHB	Opleidingscentrum Hout & Bouw
OSRM	Open-Source Routing Machine

RCXB	Red de Cuidades por la Bicicleta
RPM	Regional Platform for Mobility
SARA	Sarajevo Satellite City
SC	Satellite City
SCU	Sivas Cumhuriyet University
SULP	Sustainable Urban Logistic Plan
SUMP	Sustainable Urban Mobility Plan
TBC	To Be Confirmed
T&T&M	Tra
TLN	Tallinn Satellite City
TMTX	Transmetrics
TRI	Triporteurs Français
TUHH	Hamburg University of Technology
UBC	Union of Baltic Cities
UCC	Urban Consolidation Centre
UF	Urban Freight
WaCaBa	Water Cargo Barge
WP	Work Package
WS	Workshop

1 INTRODUCTION

1.1 OBJECTIVE

The aim of this ***D2.1 Implementation roadmap*** is to consolidate the results of the stakeholders' analysis in the different metropolitan contexts and mobility economy ecosystems within each of the four Living Labs. Furthermore, this deliverable presents the setting-up and implementation of the stakeholders' management cycle in the four cities.

1.2 EXECUTIVE SUMMARY

The **methodology** is centered on active stakeholder engagement and a structured approach to co-creating logistics solutions within each Living Lab. At the beginning stands the **Stakeholder Mapping** process, where key local stakeholders in each metropolitan area are identified and engaged. This process is to ensure that all relevant actors, such as local businesses, transport operators, and governmental bodies, are involved in the design and implementation of the logistics solutions.

Once stakeholders were identified, the work progressed through a series of collaborative workshops and meetings aimed at **defining and refining the use cases**. These use cases were developed iteratively, incorporating feedback from local stakeholders to address specific urban logistics challenges. The project also utilized a Stakeholder Management Cycle, which includes steps such as clarifying objectives, mapping stakeholder relationships, profiling stakeholders, and developing involvement strategies to maintain continuous engagement throughout the project's duration. These use cases are tailored to address specific challenges within each Living Lab, focusing on optimizing logistics operations and reducing environmental impacts

The **Hamburg** Living Lab focuses on integrating waterway logistics with cargo bikes for parcel delivery. The use case leverages the city's network of waterways, utilizing electric barges to transport goods to the city center, where cargo bikes then take over for the last-mile delivery. This multimodal approach aims to reduce traffic congestion and lower emissions in the urban core, demonstrating the potential of combining traditional and innovative logistics methods.

In **Istanbul**, the project enhances the operations of the MIGROS supermarket chain by introducing digital tools and e-cargo bikes for more efficient last-mile delivery. A key component of this use case is the establishment of a collaborative Urban Consolidation Centre (UCC), where multiple logistics operators can consolidate their deliveries. The UCC also features integrated charging stations for electric vehicles and parcel lockers for secure parcel deliveries, contributing to a streamlined and sustainable urban logistics network.

The **Nantes** Living Lab explores ways to optimize existing logistics operations by leveraging ICT tools and introducing temporary logistic hubs. These hubs, made from modified shipping containers, are strategically placed in public spaces to serve both professional logistics operators and citizens. The project also includes services such as cargo bike rentals, bike repair stations, and secure storage facilities, making the logistics infrastructure accessible to a broader audience while reducing the environmental impact of urban deliveries.

The **Logroño** Living Lab focuses on consolidating logistics flows through the use of micro-hubs and cargo bikes. The use case includes the development of a parcel locker network, allowing local businesses to offer out-of-hours delivery options. Additionally, the project integrates reverse logistics systems to manage waste collection from local businesses, further enhancing the efficiency and sustainability of last-mile logistics in the city.

The path to realising the use cases is mapped out by the **Implementation Roadmap:** it outlines the necessary steps and actions required to move from the initial definition of use cases to their full-scale

demonstration. This roadmap serves as a guide for each Living Lab, ensuring that the logistics solutions are implemented systematically and effectively.

Key components of the roadmap include:

- **Milestone Identification**: This involves setting clear milestones that mark the progress of the project, including stakeholder engagement, integration of ICT tools, and the establishment of logistic hubs.
- **Task Assignment**: Specific tasks are allocated to partners within the consortium, with clear responsibilities outlined to ensure that all aspects of the project are covered and that each partner contributes to achieving the project's goals.
- **Workshop Facilitation**: Regular workshops are organized to discuss implementation strategies, refine use cases based on stakeholder feedback, and address any challenges or obstacles that may arise during the implementation phase.
- **Regulatory Considerations**: A thorough regulatory analysis is conducted to ensure that the logistics solutions comply with local and European regulations. This step is crucial for facilitating the adoption of the solutions and ensuring their long-term viability.

The project **integrates a range of ICT tools** designed to enhance efficiency, such as tracking systems, load optimization software, and real-time monitoring solutions. These tools are developed and implemented in collaboration with stakeholders to ensure they meet the specific needs of each Living Lab. For instance, in Nantes, ICT tools are used to optimize the operations of existing logistics hubs, while in Istanbul, digital solutions support the planning and execution of last-mile deliveries using e-cargo bikes. The integration of these tools aims at reducing transportation times, lowering emissions, and cutting costs across the urban logistics chain.

1.3 Deliverable structure

Deliverable D2.1 is structured along the following chapters. **Chapter 2** describes the methodology for identifying the stakeholders in the Living Labs of Hamburg, Istanbul, Logrono and Nantes, to define the use cases and the implementation strategy. **Chapter 3** describes the use case development process and takes a closer look at the various use cases of the four living labs as discussed with the stakeholders, while **chapter 4** analyses the stakeholder mapping. **Chapter 5** focuses on the implementation roadmap and is the focus of this deliverable. It identifies local business opportunities, describes the results from the workshops on the various implementation strategies, sheds light on the identified priorisation criteria and on the hub implementation itself. **Chapter 6** finally sheds light on the integration of IoT/ICT technologies within the various use cases, based on the needs identified from the stakeholders. The report ends with a brief conclusion.

1.4 Overview of the WP2 context and related inputs

Work package 2 (WP2) of the DECARBOMILE project focused on the **engagement of local stakeholders** in the four Living Labs – Hamburg, Istanbul, Nantes and Logroño – and on the development of the use cases. The involvement of stakeholders is crucial for the successful implementation of the various use cases. In the various Living Labs, local stakeholders played a **key role** in defining the needs and related potential solutions, including required technologies and necessary innovations. The experience of the first two years of DECARBOMILE has indicated that collaboration with stakeholders is a continuous process. By exchanging with stakeholders that participated in the various workshops, it became clear that even at this stage of the project (M23), the involvement of new / additional organisations and stakeholders can still be needed for the successful implementation of the use case. At the time of writing, stakeholders are therefore still being involved or even consulted for the first time. In this respect, the following deliverable describes a snapshot of the project.

Deliverable 2.1 (D2.1) especially covers (first) results from tasks 2.1, 2.2 and 2.4 since M1 (status: August 2024).

Task 2.1 aimed for the **identification and involvement of local stakeholders**. The task included a Co-mapping of the local stakeholders (subtask 2.1.1), i.e. by performing stakeholders' analysis in Living Lab´s metropolitan areas and mobility economy ecosystems and the recruitment of local stakeholders (subtask 2.1.2)

Tasks 2.2 focused on the **analysis of local needs and co-design of the use cases** with local stakeholders. The task comprised an analysis of the local societal needs (subtask 2.2.1) and especially the definition of the use cases of the various Living Labs (subtask 2.2.2).

Tasks 2.4 focused on collaborative recommendations for the implementation strategy of the demonstrations. It aimed to set the baseline for the harmonisation and formulation of the living labs' implementation strategy embedded in regional and national strategies, as well as set priority in the actions to be carried out.

We would like to draw the reader's attention to the connection between this deliverable and **deliverable 2.2 on co-creation methodologies**, which was completed at the same time.

D2.2 will provide an insight into the work process behind the results presented in D2.1. It showcases co-creation methodology, tools and workshops conducted. It details the engagement strategy used to identify and collaboratively create the use-case definitions and implementation strategy presented below. Since D2.2 is intended to illustrate the work process rather than present the final results of WP2, some results in D2.2 may refer to earlier versions of the use-cases or represent a previous status of work, which may not fully align with the finalized results in D2.1.

Note to the reader: When this report is finalized, the use cases in the different Living Labs will still be in preparation. This may lead to further changes (e.g. in the use case definition or the stakeholders involved). The following chapters describe the **project status until M24.**

2 METHODOLOGY

To ensure stakeholder´s participation in DECARBOMILE, the project partners have applied various methodological approaches. The following chapter provides an **overview of the methodology in WP2**, including the **stakeholder mapping** to identify and engage local stakeholders, the **use case definition**, the workshops aimed at designing the implementation roadmap as well as the **stakeholder management cycle**. The following chapters then describe the respective methodologies in more detail.

2.1 Stakeholders Mapping

Identifying and involving the local stakeholders was one of the key objectives in WP2 (Task 2.1, M1-M6). To create favourable conditions for the implementation of the project and to ensure a proper use case design, the WP2 partners first focused on gaining a local stakeholder overview for last-mile logistics demonstrations by performing a co-mapping of local stakeholders (subtask 2.1.1). HAM, IMM, LGN, and NANTES conducted a mapping and analysis of their local **stakeholders,** supported by project partners, respectively: LIHH in HAM, SCU in IST, RCXB in LGN and ID4CAR and CARA, in NANTES, who facilitated these analyses by identifying relevant local actors through their networks. TUHH provided scientific support by setting up the stakeholders' management cycle. IT ensured an exhaustive and harmonized mapping across all living labs.

In Subtask 2.1.2, following the co-mapping, Living Lab partners engaged in **recruiting the identified stakeholders**. HAM, LGN, NANTES, and IST managed interactions (i.e. workshops) with stakeholders in their respective cities, with support from the local network partners. The co-mapping has been based on a collection and clustering of potential local stakeholders during the project team meeting and has been continuously updated based on the results of various stakeholder meetings. IT supervised the process to ensure comprehensive stakeholder recruitment and updated the stakeholder maps with successfully recruited actors. CBS and IT defined the concrete action line for stakeholder interaction in the DECARBOMILE collaborative process, presenting it to stakeholders. The overview of local stakeholders, actions, and targets has been continuously updated with contributions from the selected actors.

The work carried out for this stakeholder mapping is further detailed in Chapter 3 of this deliverable.

2.2 Use case definition

Once the project's stakeholders had been identified, the consortium focused on **defining the use cases** (Task 2.2, M7-M12).

Defining the use cases was an iterative process which involved different tools and partners along the process. First, the use cases were pre-defined in the Grant Agreement, based on the expertise of the consortium partners and the partial knowledge of the local context.

Then, another iteration was made through the workshops involving the external stakeholders (WS1, 2 and 3 particularly) which allowed to consider the needs and challenges raised by local stakeholders. In parallel, a benchmark of previous and ongoing similar use cases on decarbonated last mile logistics in urban areas was conducted, which allowed to draw lessons learnt to build on for the DECARBOMILE use cases.

Finally, the different studies conducted in the frame of the project (architectural and technical requirements to implement logistics activities in a hub (see chapter 5), mapping of the charging infrastructure network in the Living Labs, …) clarified the use cases regarding feasibility aspects.

A "use case definition coordination team" was made up to carry out Living Lab individual focus group meeting and support them in the refinement of the use cases, based on the needs and challenges identified in their local situation. Each coordination team had representatives from different Work Packages, ensuring a cross-sectoral expertise to support the definition, including logistics experts, business models professionals, and ICT Tools representatives. Each use case has now a document which is regularly updated based on new developments, recent meetings with local stakeholders and implementation details of the experimentation.

Several topics and questions were analysed for each use case definition, including:

- type of actors (logistic service providers, local shops and clients, private companies, etc.),
- type of goods to be transported (food, fresh products, waste, parcels, pallets, beverage, etc.),
- type of innovative methods chosen to facilitate load breaking (mini/micro hubs, lockers, improvement of an existing hub, etc.),
- type of vehicles for decarbonated last mile delivery (cargo bikes, boat, electric scooter, etc.),
- ICT tools.

The above-mentioned aspects have been discussed in several follow-up meetings with project partners and several workshops organised in each Living Lab with local stakeholders. **Chapter 4** describes more details on the use case definition methodology in each Living Lab and a synthesis of the use cases still active, on hold and dismissed.

2.3 Stakeholder Management Cycle

The stakeholder management cycle supports the stakeholder engagement process and helps to profile the stakeholders. It consists of 5 steps:

1. Clarify the objective and system boundaries
2. Identification of stakeholders and their relationships (Stakeholder Map)
3. Scope the processes by integrating the process view (Process Model)
4. Profile Stakeholders to evaluate the setting and the influence on the change process (Stakeholder profiles)
5. Derive adequate involvement strategies for stakeholder engagement in change processes (Power-Attitude-Matrix)

Figure 1: Stakeholder Management Cycle (Source: Wolff, 2014)

The objectives and system boundaries (1) have been identified in the beginning and also in the Use Case Definition Sheet (ongoing process in some Living Labs).

The stakeholders and their relations (2) have been identified before the first stakeholder workshop and have been updated during the project. This step helped to identify the key, primary and secondary stakeholders.

The Process Model (3) has been developed to create a common and holistic understanding of the situation and the stakeholders involved.

In the next step (4), the stakeholders will be mapped according to their influence and their attitude towards the project to justify the involvement strategies.

2.4 WORKSHOPS WITH LOCAL STAKEHOLDERS

Based on the stakeholder analysis, all Living Labs and Satellite Cities were invited to arrange and facilitate kick of meetings (KOMs) with relevant local stakeholders identified. The kick of meetings took place as follows:

- Hamburg 20/02/2023
- Istanbul 25/01/2023
- Logroño 23/02/2023
- Nantes 01/03/2023

Following the kick-off meetings, the Living Labs organised working sessions with stakeholders to further discuss and detail each use case. CBS provided guidelines as a methodological framework for these working sessions, which aimed at:

- identifying local needs and challenges building on the KOMs results
- defining the use cases (including potential interviews and field visits in each LL, and a summary of the type of needs / flows / logistic scheme / geographical perimeter for each use case).

Partners involved in these activities, in addition to the LLs local partners, were NANTES, UBC, IT, LIHH, TUHH, CAPIT, CBS, TMTX, GGI, and CARA.

In parallel, T2.3 (M10-M18) identified obstacles and opportunities for local business development, based on each use case defined, through a set of two workshops in the Living Labs (cf. D2.2).

1. Workshop Business Development
    - Hamburg 28/08/2023
    - Istanbul 09/06/2023
    - Logroño 05/06/2023 and 07/06/2023
    - Nantes 21/06/2023

2. Workshop Business Development
    - Hamburg 02/11/2023
    - Istanbul 18/02/2024
    - Logroño 08/03/2024
    - Nantes 02/11/2023

The goal was to implicate and engage stakeholders in each step of the cocreation process and throughout the implementation of the use cases. For this, it was important to identify which stakeholders want to be involved in which use cases (bearing in mind that some of them have already

been pre-identified during the Kick off meetings held in each LL earlier in 2023), and how (identify the actions, level of engagement, roles, calendar, success criteria, etc.).

The workshops are further detailed in Chapter 5.

3 STAKEHOLDERS MAPPING

3.1 INTRODUCTION TO THE STAKEHOLDERS MAPPING

Following the project kick-off meeting in September 2022, initial meetings were organized with the project partners to better understand the scope of their proposed use cases and potential networks and who and how external stakeholders, both within and beyond their network, could be engaged. These meetings build up upon the preliminary use case definitions followed by a discussion of who would need to be involved in the co-creation of each use case as per the purpose of the project.

To encourage the partners to think about who should be involved in the project as external stakeholders, CBS sent an Excel spreadsheet to each LL partner to fill out where they recorded potential stakeholders including information about each stakeholder, e.g., details of a contact we could reach out to. Within the spreadsheet, partners were asked to rank the potential stakeholder on a scale of 1-5 for the following criteria:

- How easily will you be able to contact this stakeholder?
- Is the stakeholder likely to join a project workshop? Are they likely to contribute to the project?
- What value has the stakeholder for the freight in the city? How relevant is the stakeholder for the project?

This document continues to be a living document, updated by each LL as new stakeholders were added as the use cases developed.

The initial analysis of external stakeholders was included in D1.1. This was completed by dividing the stakeholders into categories as follows:

Stakeholders category	Stakeholders sub-category
End consumers - B2B	Hotel / Restaurants / Cafés
End consumers - B2B	Shopkeepers
End consumers - B2B	Services/Offices
End consumers - B2B	Other
Local economical actors	Supermarkets
Local economical actors	Wholesalers
Local economical actors	Markets
Local economical actors	Industry
Transport & Logistic operators	-
Craftsmen & Trade companies	-
Federations/associations	NGOs and Environmental associations
Federations/associations	Shopkeepers, economical, craftsmen associations/federations
Federations/associations	Transport & Logistic operators associations/federations
Federations/associations	Inhabitants / district associations

Local/Governmental Authorities	-
Real estate and infrastructures	-
Educational institutions and Universities	-

After the stakeholder analysis in each of the LL' metropolitan areas and their logistics ecosystems was finalized by the LLs with support from project local partners, CBS started clustering the stakeholders based on the framework provided by TUHH, which highlighted the above-mentioned categories. CBS additionally provided a local stakeholder mapping for each LL showcasing the current key stakeholders of the deliveries and logistics services, based on the initial stakeholder mapping exercise done during the KOM combined with following ranking activity and the presentation during the technical visit. In this final visual (see in each of the LL sub-chapter below), the centre indicates the core of the services – meaning the most direct/high impact stakeholders, and the further out you reach, the more indirect stakeholders are listed. A detailed insight into all stakeholders mapped during the Kick-Off meetings was provided in D1.1 State of the Art and Baseline. The section below will shortly summarise the findings again and showcase the baseline stakeholder situation in each Living Lab.

As a second step to the mapping exercise, CAPIT created a complementary clustering method, to classify the stakeholders between three categories: niche sector, early adopter and niche flows. The overall idea is to identify stakeholders who may be linked to challenges tackled by the use case, by either being affected by the challenge, or an enabler to address it. If affected, the stakeholder may have and interest to address the identified challenge, which generates an added value to the stakeholder.

Below are the definitions for each category, as described by CAPIT:

1) Strategic enterprises (and **niche sectors**) are usually part of a specific industry segment that is distinct and not yet widely adopted. They might be involved in cutting-edge technologies or specialized markets. They whether:
   a) Set good practices for achieving impact (for ex. savings, traffic and emissions contribution & reduction, etc.) and adapt their current operations for a more sustainable LML configuration (called "beacon effect" in the table below)
   b) Can help prioritize public resources to foster relevant sustainable LML infrastructure, through their potential impact/ visibility/ recursive capacity/ logistics activity's intensity/ etc. ("viral and magnet effect")

2) **Early adopter enterprises** are typically characterized by their willingness to take risks, invest in unproven technologies, or explore new business models. They play a crucial role in driving the adoption of innovations from niche sectors to broader markets. Moreover, they are:
   a) Archetype[1] of their sectors to help to build forecast models
   b) Willing to adapt their operations
   c) Willing to lead this process
   d) Ready to share data on their current operations
   e) Potentially viral

[1] Archetype enterprises are model/average companies in a sector, i.e. there are many like them.

3) **Niche flows**[2] are those who facilitate the movement of goods, services, or information within specialized or emerging markets. These flows are often not fully established and may require support or intervention to scale. These flows are enabling synergies with others to complete current routes (reduce them, speed them up to make more within the same time) or complement them (increasing resources use in other time windows).

This additional clustering gives a more detailed overview on the stakeholders engaged:

	Niche Sector				**Early Adopter**					**Niche Flows**	
Logistic Demand or Offer	Beacon / Champion	Visibility	Recursive capacity	Logistic intensity	Archetype	Adapt	Lead	Data & Share	Viral	Complete	Complement

As DECARBOMILE progressed, it became clear that stakeholders' engagement is not a one-off exercise. It is an **ongoing process**. As the use cases in the four living labs evolve, it becomes increasingly clear that, in many cases, other players are becoming more relevant than previously anticipated. On the other hand, it may be the case that stakeholders who were initially considered important are of less relevance than previously expected.

3.2 HAMBURG

The Hamburg Living Lab did a brainstorming session about the most important needs and challenges in connection with last-mile logistics and the foreseen use case in Hamburg. Building up on this the Hamburg living lab created a first proposal with the relevant stakeholders. This involves a variety of local stakeholders, including individuals, groups, and companies, who are either directly or indirectly impacted by its activities. These stakeholders encompass:

- End consumers
- Local economic actors (e.g., supermarkets and industries)
- Transport and logistics operators (e.g., Deutsche Post DHL)
- Associations and organizations (e.g., NGOs like Naturschutzbund Deutschland)
- Local government authorities (e.g., Bezirksamt Mitte, BWI and BVM)
- Community inhabitants

[2] Niche flows are flows likely to trigger consolidation with others because they are flexible in requirements/constraints (time, resistance, temperature, …), and/or stable (high frequencies and volumes).

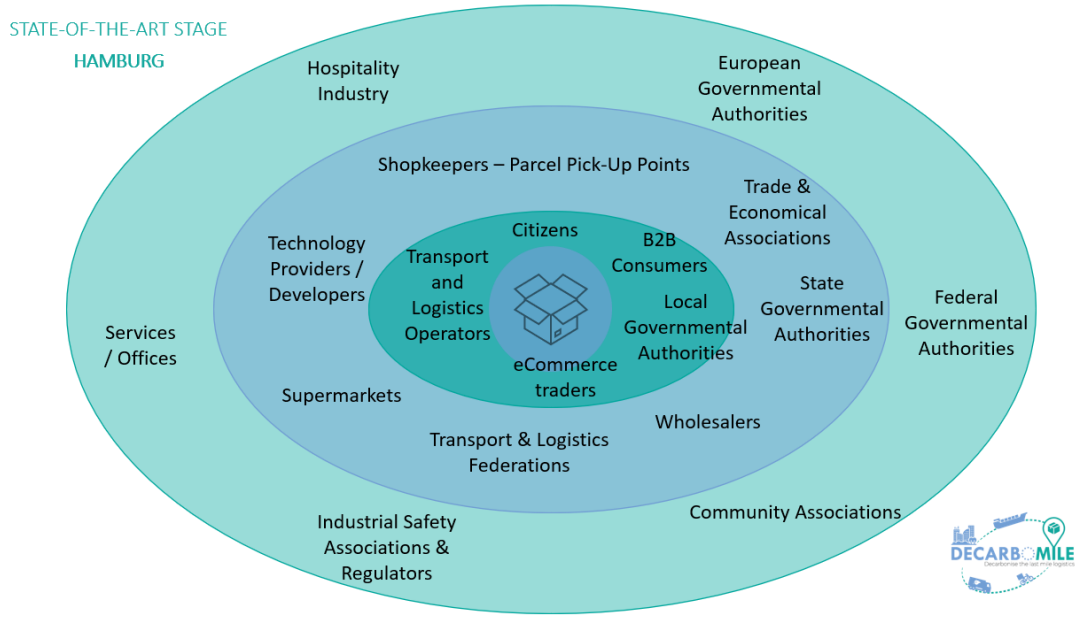


Figure 2: Mapping of Hamburg Living Lab demonstrating the current scenario's key sets of stakeholders (Source: CBS, 2024)

Workshop 1: Kick-off meeting (20/02/2023)

Main topics: introduction, stakeholders, involvement opportunities, needs and challenges

Objectives of workshop 1

The main objectives of workshop 1 in LL HAM were as follows:

- Involvement of local stakeholders (companies, universities, citizens, authorities, etc.) to the Hamburg living lab.
- Identification of the most important needs and challenges related to last mile logistics and the use case in Hamburg.
- Identification of possible stakeholder involvement opportunities in the next project activities and the use case Hamburg

Attendees and stakeholders

For the kick-off meeting, the Living Lab in Hamburg convened a workshop with 18 attendees from various stakeholder groups. Among the participants were representatives from the following organisations:

- Fraunhofer CML - as they ran the WaCaBa Study that was used as the basis of the pilot idea
- Quartiersmanagement City Süd - can contribute as a potential customer since the pilot sight lies within their area of responsibility
- BUKEA (Ministry of Environment, Climate, Energy, and Agriculture) - responsible for water regulations, thus highly valuable as a stakeholder
- Otto Wulff BID GmbH - running the business improvement district and represents shop owners and local business people in the delivery area
- HPA Hamburg Port Authority - responsible for water
- Gustav Seeland GmbH, and DP DHL.

Findings and results

Several stakeholders emphasized their interest and potential contributions since the potential pilot site falls within their area of responsibility. The workshop participants discussed and identified local needs and challenges that are related to the use case implementation. Needs identified included a green commitment from the public as well as space for micro hubs, bike parking and staff infrastructure. Challenges identified included aspects such as monument protection, the necessity of various route options and potential conflicts related to the use of public space.

CBS developed the stakeholder mappings based on the results from the KOMs in each Living Lab. These images were used to demonstrate the initial interdependencies among the various stakeholders in each of the locations and highlight which stakeholders were key for the development and implementation of the use cases.

Stakeholder involved in the Use-Case (as of June 2024)

Stakeholder	Role	Responsibility
DPDHL Deutsche Post AG a brand of the DHL Group used for its domestic mail services in Germany. The services offered under the brand are those of a traditional mail service.	Logistic operator	Delivering packages to the Loading point and last mile delivery with cargo bikes Providing: - Cargo bikes for the last mile delivery - Delivery personal - Micro Hub (container)
OHB Opleidingscentrum Voor Hout En Bouw Vzw is an expert group and training centre for city logistics and distribution of construction material.	Logistic operator	Training the local skipper & Operating the Barge Providing: - Electric barge with scissor lift and skippers
Hamburg municipality Freie Hansestadt Hamburg as representative for the Hamburg municipality.	Infrastructure and regulations	Preparing the Loading and unloading points Providing: - Ground space for Micro Hub in the City centre - Legal permits for waterway access

Key partner for the implementation and operational phase of the Use-Case

Area of operation	Stakeholder	Responsibility
Logistic Operation	**LSBG**	Operating the sluices provider of option B for the unloading operation
Ground space	**Ruderverein Rille**	Providing loading site and parking for the boat
Hardware tools	**RYTLE**	Providing the bikes and the Hub for DPDHL
Legal Frameworks and Permits	**Water police**	Legal admission of waterway access (route etc.)
	District Hamburg-Mitte	Legal admission of constructions
	HPA & BUKEA	Porth authority / waterway access
	Urban Data Hub	Access and distribution of data

Software tools & Data analysis	**HPA**	Providing relevant water / weather data
Technical partners	**NGS**	Providing the sensors for the barge
	GGI	Analysing data providing the results
	TMTX	Data processing

3.3 ISTANBUL

The local stakeholders that were analysed in this Living Lab are either individuals or a group of people or companies that are indirectly or directly affected by the actions of the Istanbul Living Lab. The figure indicates how currently everyday retailers from supermarkets and related services are the key central actors for the existing delivery demand, primarily executed by third-party delivery services. In this visual, the centre indicates the core of the services – meaning the most direct/high impact stakeholders in the centre and the further out you reach, the more indirect stakeholders are listed. For a perfect collaboration, the main stakeholders should be informed about the rough project process and should come together and discuss the current state of the project regularly - the goal is to reach a consensus for further procedures.

Based on a preliminary mapping, the following stakeholder groups have been identified as extremely valuable to the project, and with a strong engagement potential for the upcoming developments: Technology providers, Transport and logistic operators, Trade association, Local and governmental authorities and Universities.

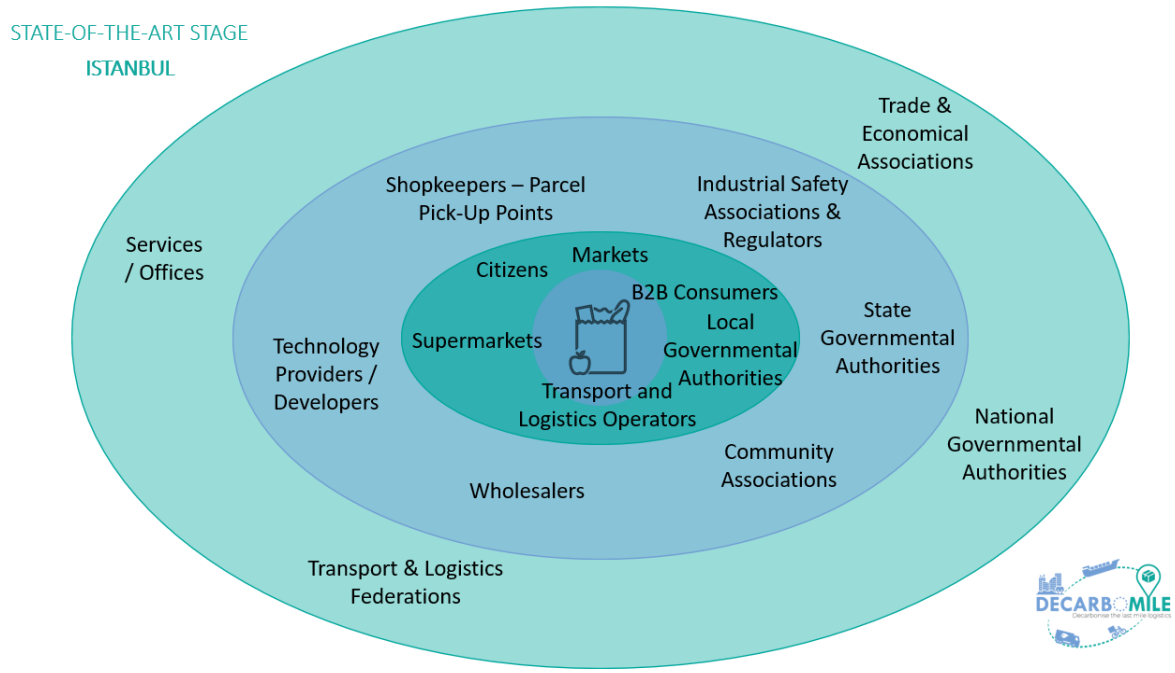


Figure 3: Mapping of Istanbul Living Lab demonstrating the current scenario's key sets of stakeholders (Source: CBS, 2024)

Finding and results for WS 1 KOM (25/02/2023)

IMM hold their first workshop with the local stakeholders identified, gathering around 100 persons from different IMM departments (smart city, logistics, urban planning, etc.), logistics operators, parcel lockers producer (Kargopark), software providers, fashion shops (Hepsiburada an online hub which 3rd party retailers like MIGROS can use to sell products), transport companies (Yango), a shop keepers' The solutions that will be implemented must promote local commerce, notably by encouraging consumers to go to the shops. Several logistic services have been identified: a hub to consolidate flows between operators to deliver the centre, a hub as point of convenience, a transport service for product transfer between shops.

Some of the biggest challenges identified by the logistics operators present at the meeting relate to congestion, as well as delivery hours and opening hours of receivers (or the lack of information on their availability), regulations or physical limitations of some streets or streets segments, and the lack of interconnection with IT systems of customers / contractors / partners. Regulations on motorization, the lack of tools to optimise the process and to analyse the activity for better strategic decisions were not identified as key challenges.

Interestingly, two operators share loads, hubs, and vehicles with other operators to increase their capacity and environmental impact, and one doesn't but would be open to. On the environmental side as well, they all said that their customers do ask for a "greener" service. Deliveries are mostly made by vans or light commercial vehicles (up to 3.5T), but two operators shared that they already use cargo-bikes, and two of them also mentioned motorcycles as a delivery vehicle.

Stakeholder involved in the Use-Cases (as of June 2024)

Stakeholder	Role	Responsibility
IMM Istanbul Metropolitan Municipality is the representative for Istanbul Municipality	Infrastructure and regulations	Providing: - Parking area of 5,213 m² - Charging infrastructure for e-delivery vehicles - Parcel lockers
MIGROS Migros Ticaret A.Ş. is one of the biggest chains of supermarkets in Turkey.	Logistic vehicle and transportation service	Construction of UCC on the parking lot Delivering goods to the UCC and operating the last mile delivery with cargo bikes (through Paket taxi) Providing: - Logistic vehicles (Electric Cargo bikes) - Delivery personal - Structure of UCC
ILETMEN ILETMEN is a logistics company specializing in efficient and reliable transportation solutions tailored to meet diverse client needs.	Logistic vehicles, operation and distribution service	Delivering goods to the UCC and operating the last mile delivery with cargo bikes Providing: - Logistic vehicles - Delivery personal

NGS (New generation Sensors)	Technical partner	Providing the sensors for the delivery vehicles
GGI (Genegis GI)	Technical partner	Analysing data providing the results

Key partner for the implementation and operational phase of the Use-Cases

Area of operation	Stakeholder	Responsibility
Logistic Operation	**ARAS KARGO**	Deliver goods to the UCC for ILETMEN
	HEPSIJET	Deliver goods to the UCC for ILETMEN
	PAKET TAXI	Operate the last mile deliveries from the UCC of MIGROS
Hardware tools	**KARGOPARK**	Providing parcel lockers
	ISTANBUL ENERGY	Providing the charging stations
	TBC	Providing two prefabricated structures for the MCC
	TBC	Providing electric Cargo bikes

3.4 NANTES

On the stakeholder mapping of Nantes, it's depicted the current key stakeholders of the deliveries and logistics services developed from the initial stakeholder mapping exercise done during the KOM combined with following ranking activity and the presentation during the technical visit. Through this visualisation, the Nantes use case relies on integrating B2B, local authorities and logistic operators to facilitate novel delivery and storage opportunities within the city centre. It is also an indicative on how the integration of such actors is required in the steps towards the upcoming interventions. In this visual, the centre indicates the core of the services – meaning the most direct/high impact stakeholders in the centre and the further out you reach, the more indirect stakeholders are listed.

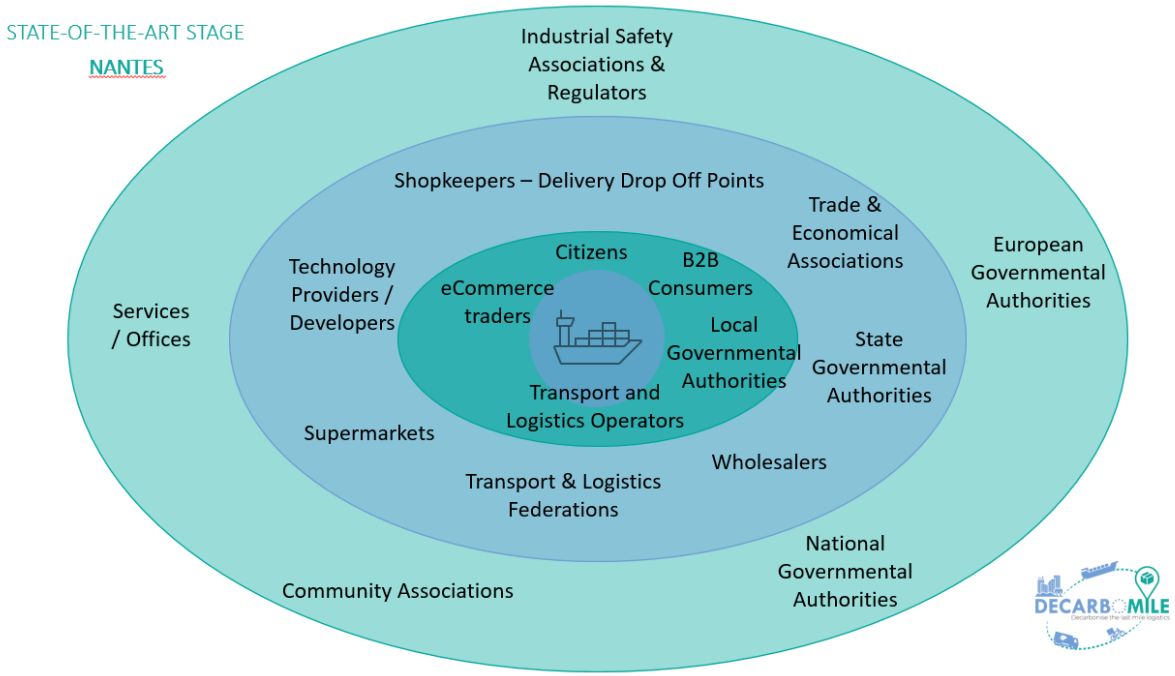


Figure 4: Mapping of Nantes Living Lab demonstrating the current scenario's key sets of stakeholders (Source: CBS, 2024)

Finding and results for WS 1 KOM (01/03/2023)
27 local stakeholders attended WS1, allowing us to share the different expectations of stakeholders regarding use cases. The three use cases were presented to the stakeholders, who expressed their preferences and joined the related use case sub-group. The prioritized needs expressed thanks to the workshop were to:

- Identify and align the available place with the needs of each actor willing to use the hub
- Identify relevant sectors with strong specificities (construction, restaurants, craftsmen, shop keepers, wholesaler, pharmacies, etc.) and provide a needs assessment of the flows for each sector and for each hub location to define the most relevant one

Local stakeholders
Relevant stakeholders of Nantes have been identified, based on their engagement potential and value to the project. They belong to the following categories:

- Interprofessional organization and consular chambers:
  - Craftsmen and freelancers: several companies are interested in the project but are currently represented by interprofessional organisations and associations.
- Associations and cooperative societies:
  - Purchasing centres, wholesalers, distributors, distributors.
  - Carriers, logistic operators, deliverers.
  - Vehicle and industrial rentals.
  - Equipment and service provider.
  - Public transportation company

Stakeholder involved in the Use-Cases (as of June 2024)

Stakeholder	Role	Responsibility
Nantes Representative for Nantes metropole	Infrastructure and regulation	Providing space and regulation framework
Triporteurs Français French pioneer in cycle-logistics	Logistic service providers	Will test the solutions and implement use case 3
Heppner Leader in international goods transport to and from France	Logistic service providers	Consolidate goods in Solilab hub
Tout en vélo Cycle-logistic operator	Logistic service providers	Deliver Heppner goods on the last mile
TBC	Logistic service providers	Operator of the hybrid station in use case 2

Key partner for the implementation and operational phase of the Use-Cases

Area of operation	Stakeholder	Responsibility
Land ground	**CCI**	Space provider
	Solilab	Space provider
Hardware tool	**Station REV**	Infrastructure provider
	Fleximodal	Providers of the last-mile deliveries vehicles
	NGS	Providers of the sensors and API linked

3.5 LOGROÑO

For Logroño, the stakeholders' mapping (figure 61) below was developed from the initial stakeholder mapping exercise done during the KOM combined with ranking exercise and the presentation during the technical visit. It shows pharmaceutical companies and markets have a key role in the existing delivery services. This set of actors are valuable stakeholders directly impacting the upcoming use-case.

Local stakeholders

Relevant stakeholders in Logroño have been identified, based on their engagement potential and value to the project. They belong to different categories with carriers (Logroño en bici or Txita), big logistic operators (DHL, GLS or MRW) as well as start-ups (REVOOLT, that delivers without carbon emission and uses new IT solutions). Additionally, local authorities, educational institutions and federations were present, together with real estate and local associations.

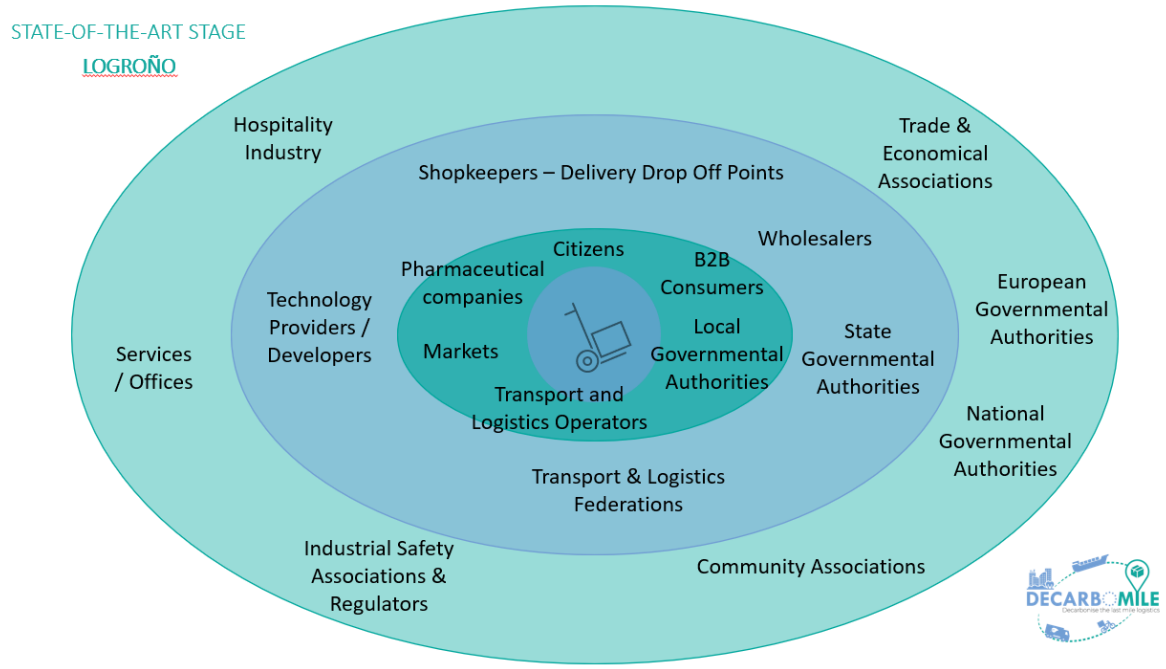


Figure 5: Mapping of Logroño Living Lab demonstrating the current scenario's key sets of stakeholders (Source: CBS, 2024)

Finding and results for WS 1 KOM (25/01/2023)

The solutions that will be implemented must promote local commerce, notably by encouraging consumers to go to the shops. Several logistic services have been identified: a hub to consolidate flows between operators to deliver the centre, a hub as point of convenience, a transport service for product transfer between shops.

There is a general need to make more attractive local shopping, without data-based awareness of who are the targets, and the right channels to address them, to settle priorities accordingly. There is a general fear to digital commerce, without a clear understanding of how that channel works and how their competence take advantage of it, resulting in a blockage. The consequence is to focus on the store channel issues, perceiving only restrictions when it comes to customers access or logistics supply. This prevents realizing the new role logistics plays for commerce (supply, marketing and development), and how it can be a differentiating factor, along with data, to capture customers.

The general approach was in line with the importance of having data, whether linked to logistics or to consumer habits, and having control over them. The opinions expressed focused on the idea that it is necessary to avoid imposed models such as Amazon, in the direction of local models, with competitive businesses that make use of digital tools to improve customer service and rely on efficient and shared logistics. Highlights the view that the citizen/customer must be aware of the importance of data and have control over it (data arising from all commercial activities) and, furthermore, that the changes that are coming, in terms of consumer habits or distribution models, must be progressive, which will result in greater awareness and level of trust among customers/citizens.

Stakeholder involved in the Use-Cases (as of June 2024)

Stakeholder	Role	Responsibility
LGN Representative for Logroño Municipality	Infrastructure and regulations	Providing: - Legal framework - Ground space for the nano hub - 2 Cargo bikes
DHL DHL is a logistics company providing courier, package delivery and express mail service	Logistic Operator	Delivering goods to the MCC and operating the last mile delivery with cargo bikes Providing: - Logistic vehicles - Delivery personal
Paseo de las 100 Tiendas Local commercial associations	Use of the parcel lockers network	Providing space for the lockers implementation and communication about the use case
CICLO XXI Local bicycle repair shop	Last mile operator	Delivering goods from the UCC to private households operating the last mile delivery with cargo bikes

Key partner for the implementation and operational phase of the Use-Case

Area of operation	Stakeholder	Responsibility
Hardware tools	**Fleximodal**	Cargo bike provider
	Regional Platform for Mobility (RPM)	Potential provider of one Cargo bike Customer for renting the hub as parking space
	Intelligent Parking (INT)	Development and Construction of the nano-hub and parcel lockers
	CICLO XXI	Maintenance of cargo bikes
Technical partner	**NGS (New generation Sensors)**	Providing the sensors for the delivery vehicles
	GGI (Genegis GI)	Analysing data providing the results
Logistic Operation	**Riofarco**	Delivering goods to San Blas
	Jimeno Tagús	Picking up waste from San Blas market for treatment

	TSYS	Consolidating flows in San Blas market

3.6 OUTPUTS AND FOLLOWING STEPS

As an output to this first exercise, a list of all stakeholders who can be potentially involved in the use case definition, and later on its implementation, was drawn. This allowed to feed into and structure the use case definition process which followed.

4 USE CASE DEFINITION

The use case definition is at the core of the project, aiming at developing relevant experimentations to test innovative concepts for urban logistics. Once the stakeholders had been identified (**chapter 3**), one or more use cases have been developed in each of the four project's Living Labs, considering each local context and the needs and challenges of the local stakeholders

The use case definition in WP2, is closely intertwined with the other WPs placing collaboration at the centre of the process. Thus, the use case definition is linked to WP3 with the ICT tool development which will help to make the operations more efficient, but also to the WP4 with the equipment development and to the WP5 with the business model elaboration, supporting the implementation of the use cases.

Knowing that use case definition is related to three other WPs, it was decided in M15 and in view of optimising the use case definition, to create focus groups per Living Labs, gathering representatives from each WPs involved and meeting as often as necessary (usually once or twice a month). It appeared that this new format of meetings, originally not planned in the Grant Agreement, was of great help in the use case definition, which was especially slowed down in Logroño and Nantes due to the initial lack of collaboration between WPs.

In parallel to these internal focus group meetings, the Living Labs also organised workshops sessions with their external local stakeholders to discuss and detail the definition of use cases.

4.1 USE CASE DEFINITION PROCESS

To formalize and homogenise the use cases definition across the Living Labs, a series of documents has been produced, where relevant partners could record updates and important elements of the definition process.

As a preliminary tool, an excel table was created to present the baseline situation (before the use case implementation), a short description of the use case, accompanied by a visual and the following categories detailed:

- Type of flows (b2b, b2c), vehicles and hubs,
- Stakeholders involved,
- ICT tools envisioned,
- KPIs to follow-up on the use case impact,
- Costs to be covered,
- Benefits to be expected (social, environmental and economic).

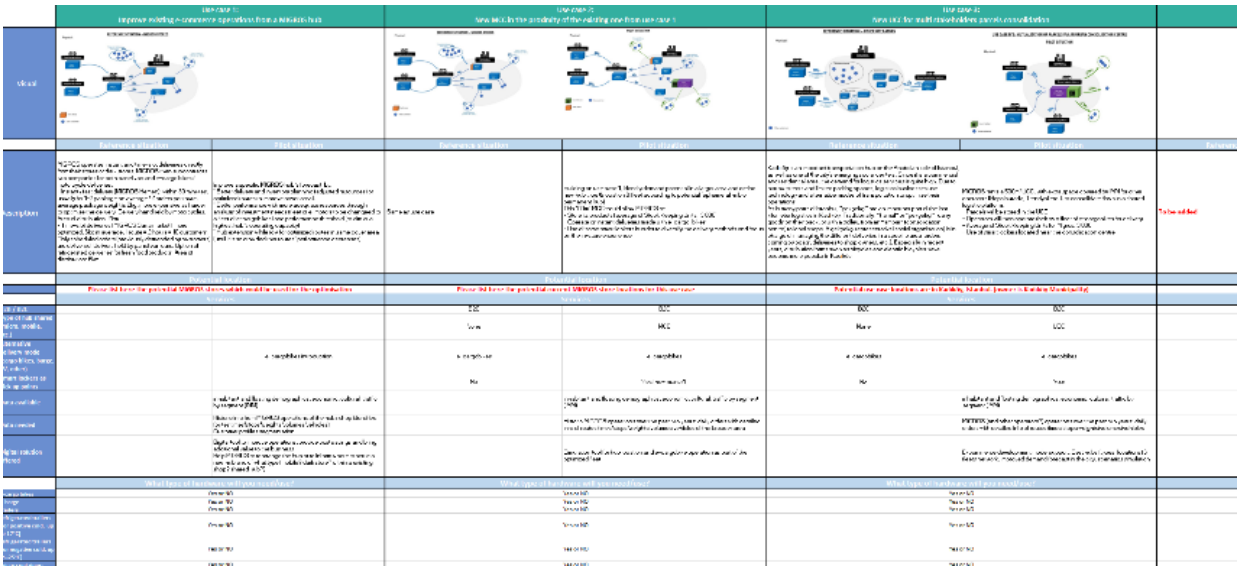


Figure 6: Preliminary use case definition excel document (Source: IT, 2023)

At first, it appeared that the excel sheets were not really used by the consortium partners and hard to keep up to date. Thus, following the "use case definition coordination team" (= focus group) implementation, these excels tables were transformed into word documents, more user friendly and easier for LLs to keep updated. The documents are updated at least twice a month, during the focus groups meetings.

The structure follows quite the same categories than the excel sheets, with the following additions:

- an introduction which summarizes the challenges that the use case implementation will aim to tackle,
- a more detailed description of the use cases (with the potential locations, added value services),
- a dedicated section for pending and upcoming tasks or meetings

Finally, a cross-Living Labs meeting was organised in July 2023, for the municipality representatives to share their challenges and best practices in the definition process. It appears that the biggest challenge was the external stakeholder's engagement in the use cases, when no business model or economic viability was proven beforehand. Associated to long administrative procedures and elections in the pilot cities, it was hard to settle the use case definition, mostly in Logroño and Nantes. Another issue in Istanbul and Logroño has been the lack of democratisation of cargo-bikes usage. Thus, only a few cycle-logistics operators are present on the territory, and in Logroño, one of the biggest challenges is to find someone willing to operate the cargo-bikes from the consolidation hub installed.

In parallel, with the objective to understand for each pilot city the type of actions to prioritise via DECARBOMILE use cases, a methodology was developed in T2.4 to assess the impact of the challenges inherent to each LL on the local logistics ecosystem.

For this, the first step has been to summarise all the challenges in five categories (urban optimisation, sustainable economics, regulatory compliance, digital collaboration and collaborative partnership) in each of the Living Labs, which had been identified during the KOM with local stakeholders, using the following table:

Urban optimisation			
	river integration in multimodal logistics operations		lack of existing and/or performing cycling infrastructure
	lack of existing/performing waterside infrastructure		high real estate price
	conflict over the use of available space		difficulty to combine last-mile delivery and shop supply
	congestion during peak hours		current hub infrastructure un-adapted to logistics use
	nature of traffic routes		underdeveloped urban public transportation
	noise pollution		lack of available location for parcel lockers
	shortage of logistics space availability in urban areas		lack of existing and/or performing charging stations
Sustainable economics			
	high level of informal labour		lack of sustainable business model
	lack of human resources		no supportive investment scheme for 0-emission vehicles
	lack of cargo-bike availability		lack of viable governance model
	low efficiency and performance of existing cargo-bikes		potential lack of companies trusts, professionalisation, leadership
	maintenance efforts of the hardware		new vehicle integration in existing operations
	lack of customers' area optimisation		ICT tool/hardware integration within the current system
	changes needed in consumption culture/habits		vehicle adaptation
	changes needed in strategic thinking from companies		lack of city clusters to consolidate last mile
	difficulty to include local commerce and retailers in urban logistics		need for a back-up plan to river logistics
Regulatory compliance			
	administrative workload in the effort to identify and comply with existing regulations		parcel size authorizations for e-bikes
	different types of goods are transported		hub safety and security norms
	manage liability of goods between the different operators		ensure quality standards
	monument protection norms		vehicles and goods safety
	lack of regulation to control urban distribution		lack of regulation in support of local commerce
	occupational safety		need for a protected walking path near water route
	future limiting regulations		special permits needed for transport of dangerous goods
Digital collaboration			
	lack of access to relevant and qualitative data		lack of data enabled decisions
	reluctance to share data		confidentiality policy

	reluctance to integrate new ICT tools		lack of awareness around data impacts
	enable sustainable data treatment		difficulty to harmonize data
Collaborative partnership			
	social acceptance of the solution		litigation risk due to competition
	stakeholders' reluctance to collaborate		trans-department visibility and interaction in municipality
	interoperability		

For each challenge identified, its impact on the elements (assets) of the logistics model (movables, infrastructure, facilities, persons/goods/information), as well as on the interactions/relations between them (transport, traffic, land use, accession) was analysed.

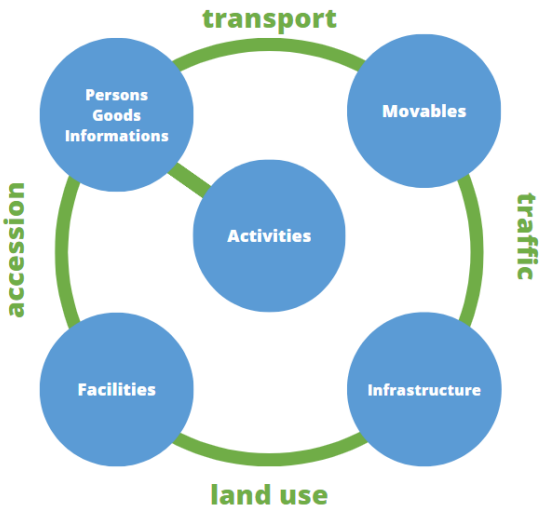


Figure 7: Logistic model (Source: Flämig, 2002)

This allows to have a clear understanding of the whole logistics system, its bottlenecks and optimization potential, and of how the challenges impact the (environmental, social and economic) sustainable performance of the local logistics ecosystem, both on the demand (service use) and offer (service provision) sides. The level of sustainability is measured based on an overarching functional criterion, which indicates to what extent the system activity, driven by demand, is concentrated/densified. In a context of scare resources, the least number of vehicles, driven distances, and operation times are required by the activity, the more sustainable the system is, up to reaching its carrying capacity.

Figure 8: Dimensions of the sustainability model (Source: CAPIT, 2023)

We now seek to understand how each specific element of the model is challenged, by how many different challenges, and to which aspect of the sustainable performance of the system it is related. An excel table developed by CAPIT provides a deeper analysis of the level at which the elements of the performance assessment and the components of a logistics model are affected by the identified challenges, individually and as a whole.

On the one side it shows what are the specific aspects of the performance of the system that are the most challenged, and through which components of the logistics model. On the other side it also gives an overview by showing which component of the system is under more pressure (higher affectation percentage / share of challenges affecting through it). Likewise for the aspects of performance the most affected over the components of the model. Finally, the excel document ranks all the challenges identified by local stakeholders, according to which level they affect the system, considering all the aspects of its performance and all its components.

Once challenges are prioritised, the use case definition may move forward by linking the **key challenged** identified to **specific stakeholders** (which have been clustered in the mapping – **chapter 3**), and to **specific actions** (based on defined objectives) as described in the use cases definition documents. If a stakeholder is affected by the challenges identified, it may have an interest to address them, as solving this bottleneck should generate an added value. If a stakeholder identifies a specific value in tackling a challenge, its involvement will be based on the required actions, the subsequent resources and the trade-off. Based on this, the use cases as described below are being defined.

4.2 Additional tools to the use case definition

In order to support the use case definition and their proper implementation, an important component includes the **setup of consolidation centres** in all LLs. For this, IT provided an analysis of the **technical requirements** of a micro hub, and RCXB organised **technical visits** with public actors to understand challenges and lessons learnt when implementing cycle-logistics, from the ground.

Hub technical requirements

To ensure a proper use of the consolidation centres implemented as part of the DECARBOMILE project, it appeared key to ensure that the locations selected for the use cases were technically suitable for last mile logistics operations.

Thus, based on internal expertise, IT developed a list of criteria to be respected by any potential hub location to implement successfully logistic activities. Six key factors stand out (see 24 below):

1. Vehicle circulation (slopes and gyration),
2. Headroom height,
3. Vehicle parking,

4. Handling and operations space,
5. Horizontal and vertical movement (lifts, …),
6. Fire safety and security rules.

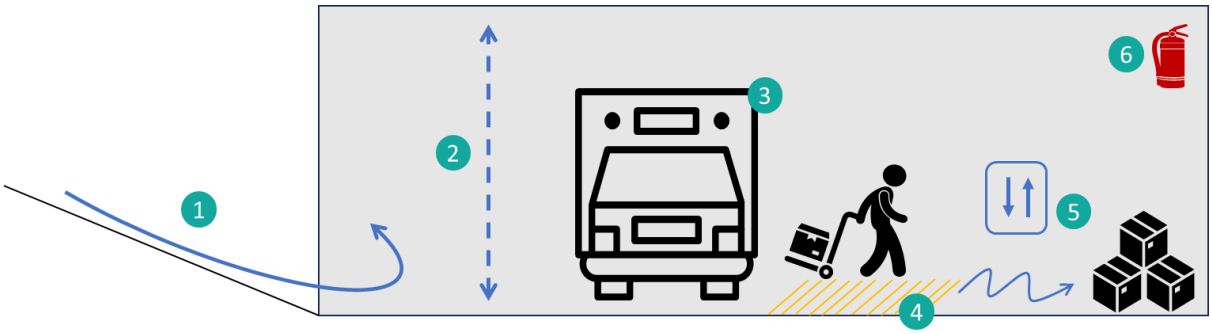


Figure 9: The six key architectural and technical requirements for a logistic hub (Source: IT, 2024)

For each of these six criteria, precise data has been detailed, with norms to respect. A checklist has also been created for the LL's representatives to use whenever visiting a new potential hub location, helping to assess the feasibility of the use cases in these locations.

Since the project focuses on cycle-logistics, an analysis was conducted to determine the ratio of space needed in a hub looking at the number of positions delivered daily with cargo bikes. Thirty interviews were conducted with logistics operators across Europe, and additional internal data was compiled to determine those ratios.

	Ratio for 1 000 positions	Ratio for 1 position
Cycle-logistics operators		
Mix	1 641	1,6
Express	194	0,2
Mail	390	0,4
Traditional logistics operators		
Express	700	0,7

Figure 10: Table representing the number of sqm (m²) needed for handling operations based on the number of positions per day and on the type of logistics activity (Source: IT, 2024)

Those ratios are meant to help sizing the activity in the new logistics consolidation centres, created through the different use cases in the LLs.

Technical visits

La Red de Ciudades por la Bicicleta (RCxB) is responsible for the organization of two technical visits in cities in Spain which can be an inspiration and referral of development of the cycling strategies, infrastructure and policies related to the last mile decarbonization of goods.

The first technical visit took place in Donostia (San Sebastian) in October 2023. It gathered 28 participants from different municipalities and regional governments willing to implement sustainable urban solutions for the distribution of goods. 4 cycle logistic operators with activity in 4 different cities in Spain shared their experience regarding day-to-day operation and challenges they face for the urban distribution of goods with cycle logistics. This visit also enabled to share the experiences and challenges of the mobility departments of 16 municipalities willing to boost decarbonized solutions in their cities.

From the workshop, the technical team of Red de Ciudades por la Bicicleta detected the following needs:

1. Clarification regarding regulations, vehicles requirements and circulation restrictions to operate cycle logistics and adjust local ordinance if necessary
2. Need of legal advice to municipalities that want to proceed with legal procedures to make public space available to implement cycle logistics
3. Need of support (infrastructure and financial support) from public administration to cycle logistics operators during at least the three first years of activity

In addition, RCxB has provided public clarification regarding possibilities to modify local ordinance to allow the circulation of trailers with no weight limit and is now working with an advocacy company specialized in Spanish public administration regulations to provide guidelines that allow the assignment of adequate public space to implement cycle logistics.

The second technical visit has been postponed to September 2024. The change of government in Logroño has delayed some procedures and therefore there was no sense to organize a technical visit when the pilot city was on standby. Furthermore, the results of the legal guideline report to municipalities could be presented during the second technical visit, which is intended to take place in Vitoria next October 2024.

4.3 Overview of the use case: Active, On Hold and Cancelled

During the first 24 months, several use cases have been developed for the different Living Labs. The following tables show which use cases are still active, which ones are on hold and which ones have been cancelled and why. Further details on the active Use Cases can be found in the ANNEXES.

Hamburg

ACTIVE USE CASES	**Short description**	
Multimodal delivery of parcels (water barge and cargo bikes)	Using river logistic (with an electrical barge) and cargo-bikes for the last-mile (in collaboration with DPDHL).	
USE CASES CANCELLED	**Short description**	**Reasons**
Reverse logistic using the barge	Collect waste on the return trip of the barge	Barge not available > used in another project
Additional stop on the route	Adding a stop during the route with lockers/MCC	No additional stop identified, as the route will probably differ (Low reliability for 2nd stop)

Istanbul

ACTIVE USE CASES	**Short description**	
Enhancing MIGROS operations	Using digital tools and new vehicles (cargo-bikes) to improve organisation and planning of the existing instant deliveries in an existing MIGROS store	
Collaborative UCC	Creation of a collaborative logistic hub with MIGROS and Iletmen + implementation of charging stations and parcel lockers, on public ground (owned by IMM)	
SCU load pooling algorithm testing	Test to pool time-slot deliveries on a same route for better efficiency in a current MIGROS store	
USE CASES CANCELLED	**Short description**	**Reasons**

Water-cargo bike intermodality	Using the Bosporus for delivery between the two side of the city	Urban logistics activities on the Bosphorus are forbidden by a governmental regulation

Logroño

ACTIVE USE CASES	**Short description**	
Logistic consolidation in MCC placed on public parking	With Logistic Service Providers consolidating their flows in the micro hubs (provided by INT). Parking and storage at disposal	
San Blas market	Local shops using the hub placed in the basement of the market to consolidate flows and deliver last-mile with cargo-bikes and do reverse logistics	
Lockers network	Creation of a network of parcel lockers through the two precedent use cases and other locations like the Cien Tiendas shopping mall for shops to deliver their clients outside of open hours	
USE CASES ON HOLD	**Short description**	**Reasons**
Community service as an added value service to San Blas market	Delivering by cargo-bikes old and dependant people with pharmaceutical goods and food	Dependant on the use case in San Blas, so waiting on this one to be finalised to explore its feasibility potential
USE CASES CANCELLED	**Short description**	**Reasons**
Transportation of old people with cargo-bikes	With the involvement of the YaYacletas association	Difficult to link to the other uses of cargo-bike. No operator found.
Train-cycles and bus-cycles intermodality	With a MCC placed near the train station to consolidate goods	Not feasible

Nantes

ACTIVE USE CASES	Short description	
Leveraging existing logistics operations through ICT tools	Use of ICT tools and new hardware to enhance current operations from Hepner and TRI	
Logistic station and Cargo bike rental service.	Introducing nano hubs on public space for both logistics' professionals (Transeco, TRI) and citizens to access different services (cargo bikes rent, bike repair, storage area, etc.). Cargo bike or trailer will also be available for rent towards craftsmen working in city centre	
Container on public space	Two shipping containers will be positioned in a public area to serve as a consolidation hub. With the installation of solar panels on the roof, the containers will be power independent.	
USE CASES CANCELLED	**Short description**	**Reasons**
Reverse Logistic	With Solution Recyclage and Coursiers Nantais using the MCC for reverse logistics	Not enough incentives regulations to collect waste from businesses
River logistics	River transport and/or floatable hub	Conditions of the river side not suitable for the implementation
Shared hub in the pedestrian area of Parc des Chantiers	Consolidation hub for green last mile delivery in the pedestrian area and transportation of heavy loads (construction materials)	No operator interested and potential usage conflict on public space (school vs trucks)
Logistic activities in bus depot	Temporary activity when the buses are not in the warehouse	No operator interested as part of the project, but will be further developed outside of DECARBOMILE
Logistics activities on public parking (city progress)	With Atlantique Boisson and an innovative vehicle for last mile delivery	Technical issue: vehicle prototype still under development

4.3.1 HAMBURG

The Living Lab Hamburg will focus on using the waterways and canals from the Billbrook district, a major industrial and commercial location in Hamburg, and the city centre. The loading point is aimed to be close to *b. d. Grünen Brücke 3* and the unloading point is planned to be located at the sluice *Schaartorschleuse (status update M24: under clarification)*.

Because this district has very limited available space for logistic operations, it is not possible to install a micro-hub. Therefore, it will most likely be a DHL container that will be placed to store the goods arriving from the barge.

A total of three delivery staff are planned to deliver about 12 containers of parcels per day (Monday to Saturday) to the customers (private and companies) located there. The barge is expected to arrive at the sluice by 10am at the latest, to provide customers with a quality delivery service. Three DHL cargo-bikes with a loading capacity of 1.8m³ are planned to be delivered to the area. This type of cargo-bike has mobile parcel containers attached to the vehicles that can be stored if needed. In this use case, 12 parcel containers are foreseen and would be stored in two micro-hubs.

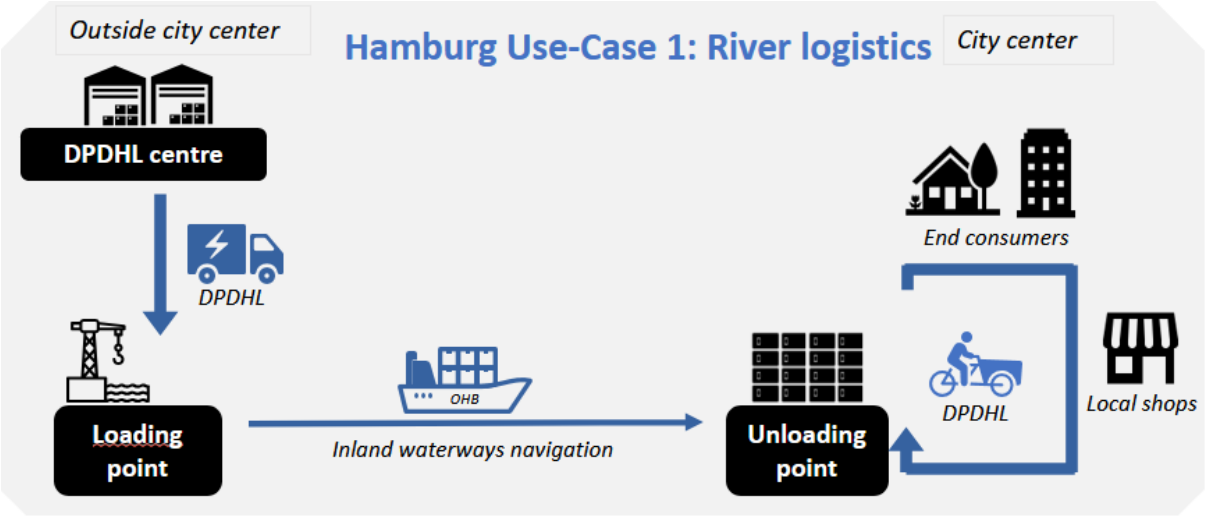


Figure 11: Living Lab Hamburg - Visual of use case 1 (Source: IT, 2024)

4.3.2 ISTANBUL

Use Cases 1 and 2 – Enhancing MIGROS operations

The first part of the Use-Case will mostly target data collection from MIGROS operations in the selected area and dedicated ICT tools development, while the second part will focus on testing those optimization algorithms and new vehicles (e-cargo bikes).

In the use case, MIGROS will use a 481smq² hub to store products and operate instant deliveries with cargo-bikes. Deliveries with motorbikes or small trucks will not be excluded, in case the 10 cargo-bikes planned in the use case are not sufficient for the coming orders. The hub is in KADIKÖY (Caferağa Mah. Sakız Gülü Sok. NO:31/B), in a current MIGROS store and has a store picking online operation model.

Due to the instant delivery model which requires quick reactivity on the deliveries, parcel lockers will not be implemented here.

The Use-Case will utilize demand forecasting and optimization algorithms to increase the planning efficiency of MIGROS deliveries with the 10 new e-cargo-bikes. The forecast target is the daily number of orders, and the forecasting horizon is from 2 to 4 weeks. Additionally, the delivery vehicles will be equipped with sensors to enable real-time transportation monitoring and reporting and to possibly introduce load optimization and dynamic routing solutions.

In addition, a load pooling tool will be tested with time-slot deliveries operated with thermic LCVs, either from this same hub, or from a different one.

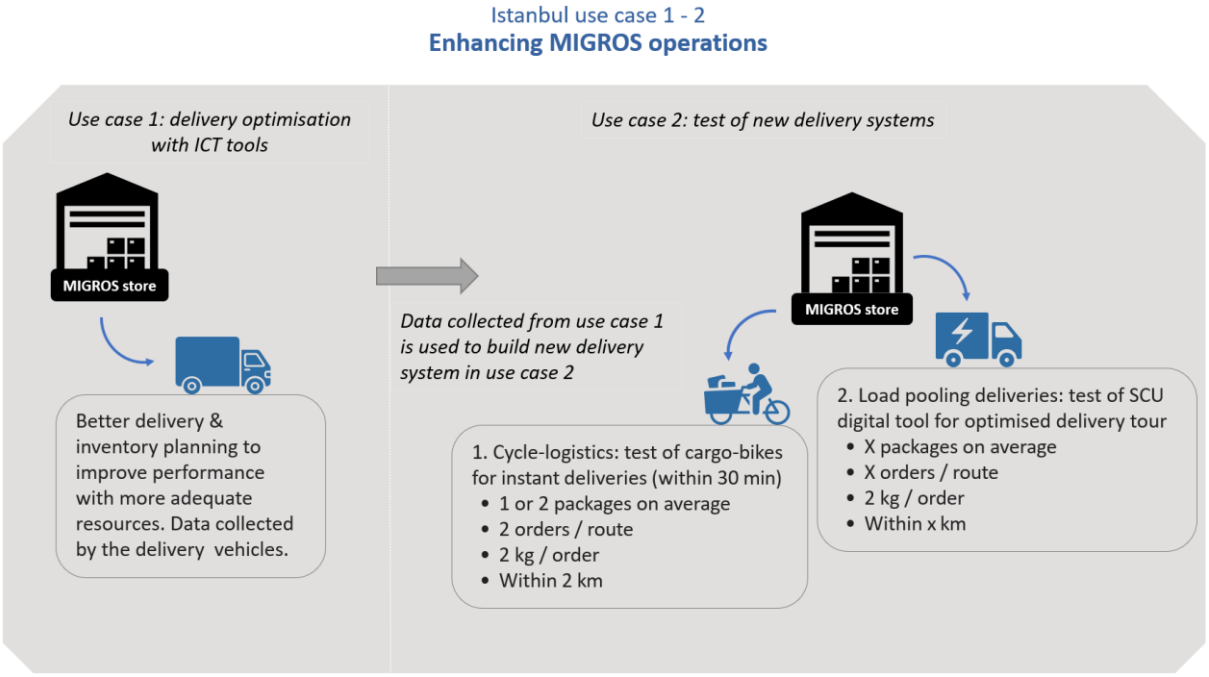


Figure 12: Living Lab Istanbul - Visual of use case 1&2 (Source: IT, 2024)

Use Case 3 – New UCC for multi stakeholder parcel consolidation

IMM is launching a 500m² Urban Consolidation Centre (UCC) as part of the DECARBOMILE pilot project to improve urban logistics efficiency and sustainability. The project will be located in a 5,213 m² parking area owned by IMM, with 500m² allocated for the UCC in the southwest corner.

Two main operators will participate in this initiative:

MIGROS, which manages an e-commerce platform with over 3,000 Stock Keeping Units (SKUs), will conduct daily distribution using electric cargo bikes funded by the project.

Iletmen, a last-mile delivery service provider for companies like Aras Kargo and Hepsijet, will operate its own fleet from this site.

The facility will include two prefabricated structures, each between 100-200m², with separate entrances for MIGROS and Iletmen. The UCC, financed and owned by MIGROS, will function as a "dark store", focusing on instant deliveries without competing with existing MIGROS operations in the area. For the period of the project, no rent will be charged to the operators as the parking space is owned by IMM and the infrastructure is funded through MIGROS' DECARBOMILE budget.

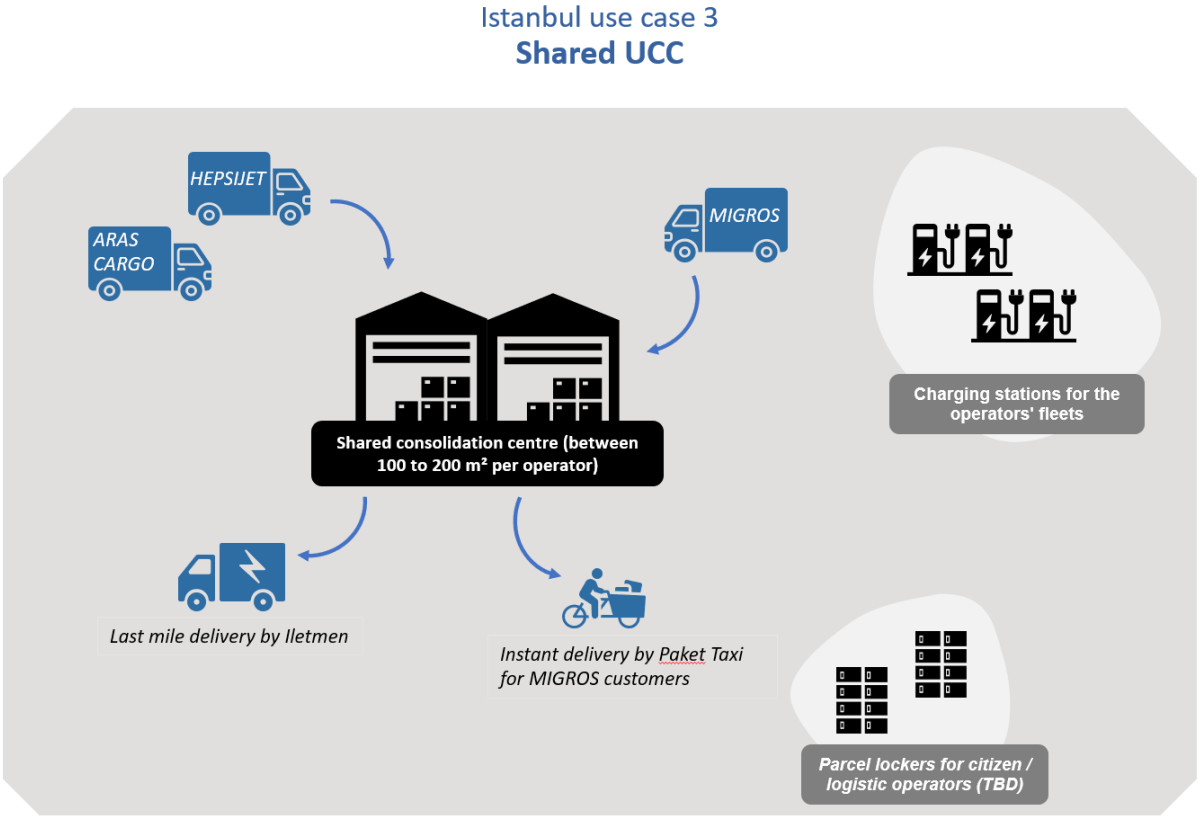


Figure 13: Living Lab Istanbul - Visual of use case 3 (Source: IT, 2024).

4.3.3 NANTES

Use case 1 – Leveraging Existing Operations

The Use-Case targets two different ways to amplify the delivery with cargo bikes.

- Use-Case 1.1: Will make use of the existing Solilab hub by Tout en vélo to consolidate flows of Heppner and other suppliers.
- Use-Case 1.2: Will use the existing Triporteurs (TRI) hub rue des Olivettes to test trackers and sensors (GPS, temperature, humidity, etc.) attached to dedicated new cargo-bikes (TricyLift from FLEX).

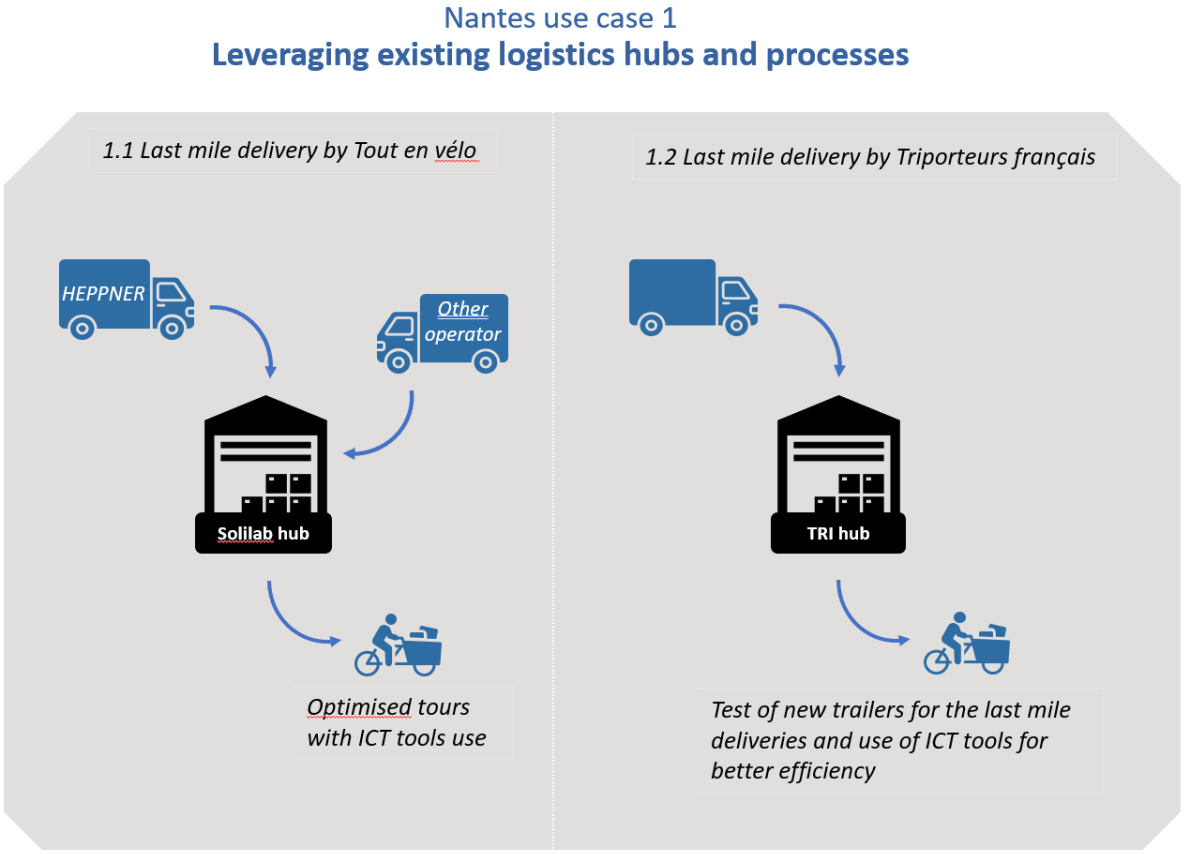


Figure 14: Living Lab Nantes - Visual of use case 1 (Source: IT, 2024)

Use case 2 – Hybrid logistic space

The idea of Use case 2 is to put together the professional and personal uses of cars, bikes and cargo bikes. This project would take place in a parking lot, in a partnership between the Municipality and the Chamber of Commerce and Industry. During the implementation of the Use-Case and the project timeframe, the area will be closed to the general public. Craftsmen and professionals that want to use the area can receive an access tag / code to test and utilize the space. This will help to regulate entry and protect the valuable materials during the testing phase. There is the possibility of opening the space to the public later.

The idea is to put on the same parking lot, three different areas:

- 1st area: Location & parking for bikes – a covered and closed place where people could rent their bikes/cargo bikes for multiple uses and could also just park their own vehicles.
- 2nd area: Storage space – the idea is to build some parcel lockers of different sizes that could store the purchases and products bought and delivered by bikes/cargo bikes there that could be picked up later by another car or just stored during a period of the day.
- 3rd area: Area of repairs – a zone inside the parking where people could have the possibility to do small repairs on their bikes.

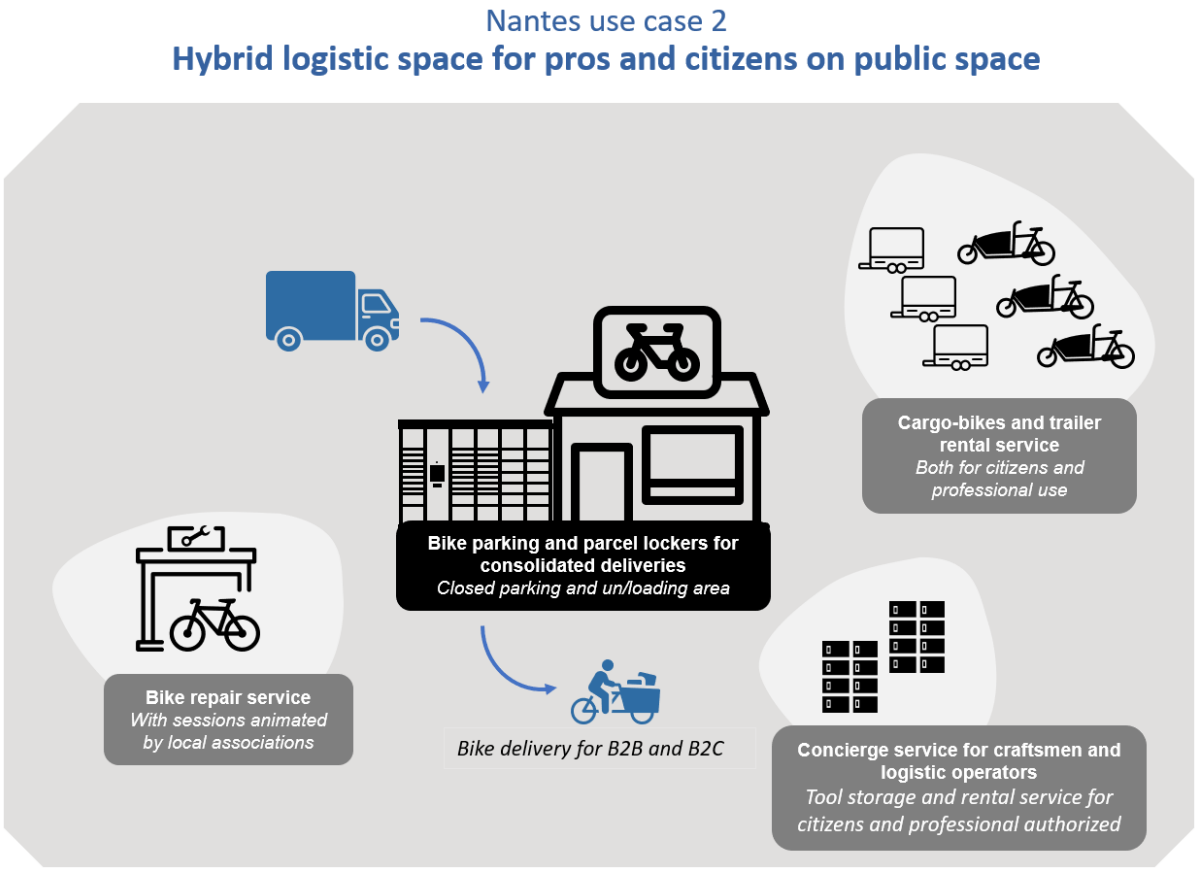


Figure 15: Living Lab Nantes - Visual of use case 2 (Source: IT, 2024)

Use case 3 –Temporary logistic hub

The idea of this use case is to use a parking space for temporary logistics operations, with the installation of an agile micro-hub. The parking space would be provided by the municipality of Nantes or at the Solilab, and the micro-hub would be provided by TRI itself.

For Use-Case 3, two shipping containers will be recycled to be used as a consolidation hub, placed on public space (CCI parking) or at the Solilab hub. The containers will have some modifications to be power autonomous thanks to solar panel placed on the roof. Two containers will be purchased (or rented), one of 40 feet (12*2.5 m) for storage purposes and one of 20 feet (6*2.5 m) as a social space. This hub will be only operated by the Triporteurs Français (consortium partners) but will be able to consolidate goods from different operators of the last mile delivery.

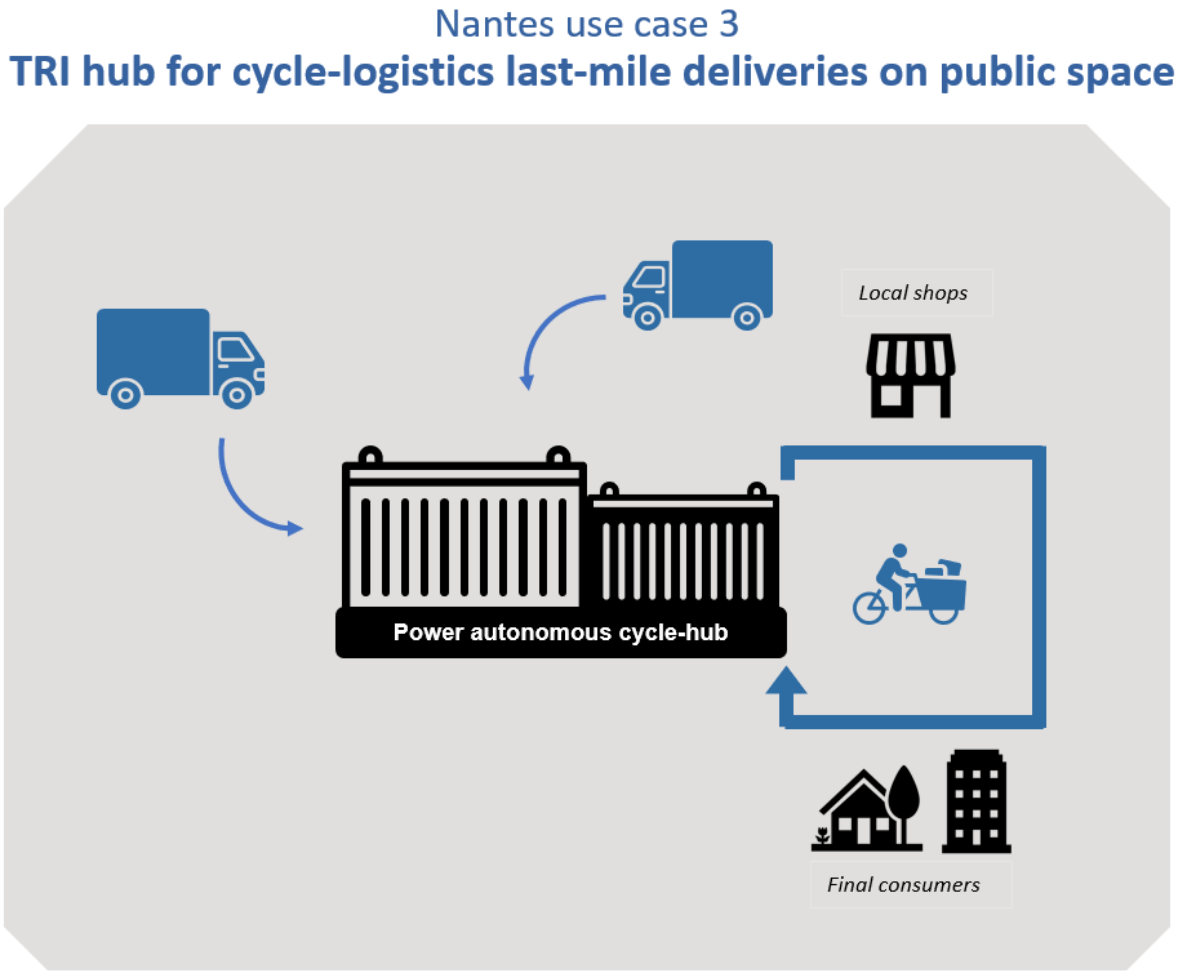


Figure 16: Living Lab Nantes - Visual of use case 3 (Source: IT, 2024)

4.3.4 LOGROÑO

Use case 1 – Consolidated flows at a nano-hub

The Use-Case aims for the consolidation of logistic operators using a nano-hub and implementing Last Mile Delivery with Cargo bikes. The nano hub will be composed of two mini hubs from INT merged (no parcel lockers) and completed by a container type for logistics purposes only (new equipment from INT from another project). LGN will provide ground space at Parkin Revellin to install the hub and Cargo bikes to operate the last mile logistics.

For now, DHL is willing to test to do the last mile with new cargo bikes (either with the RPM cargo bike or 2 ones owned by the municipality). LGN is exploring the possibility to rent cargo bikes during the project timeframe, to provide more options at the micro hub. In the future, other logistic operators such as GLS, MRW or DASHER could utilize the hub to implement last mile delivery by cargo bikes. Also, the Regional Platform for Mobility (RPM) is interested in utilising the nano hub for parking one of their rental cargo bikes (either to DHL or to private consumer (B2C)).

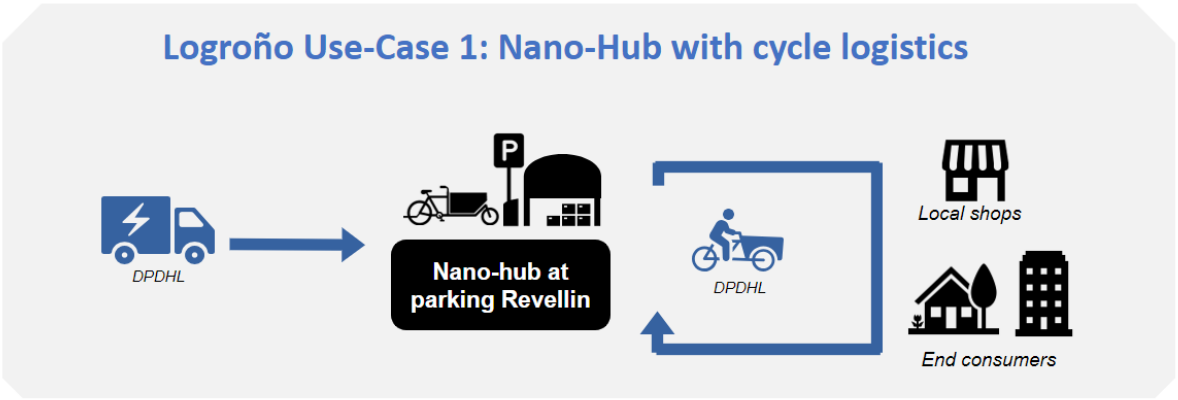


Figure 17: Living Lab Logroño - Visual of use case 1 (Source: LGN, 2024)

Use case 2 – UCC at San Blas market

This use case will focus on consolidating flows from the local market San Blas, with the creation of a consolidation centre in the basement, serving for storage purposes mainly for San Blas shops and other places if need be. Vehicles of the operators would then continue their tour after they left the parcels at the hub, while the last mile delivery will be done by a cycle-logistic operator with electric cargo bikes. The ground floor of the UCC is 25m² and can serve for un/loading operations from different suppliers (DHL, Riofarco, merchants...) for the last mile operator Ciclo to sort and operate.

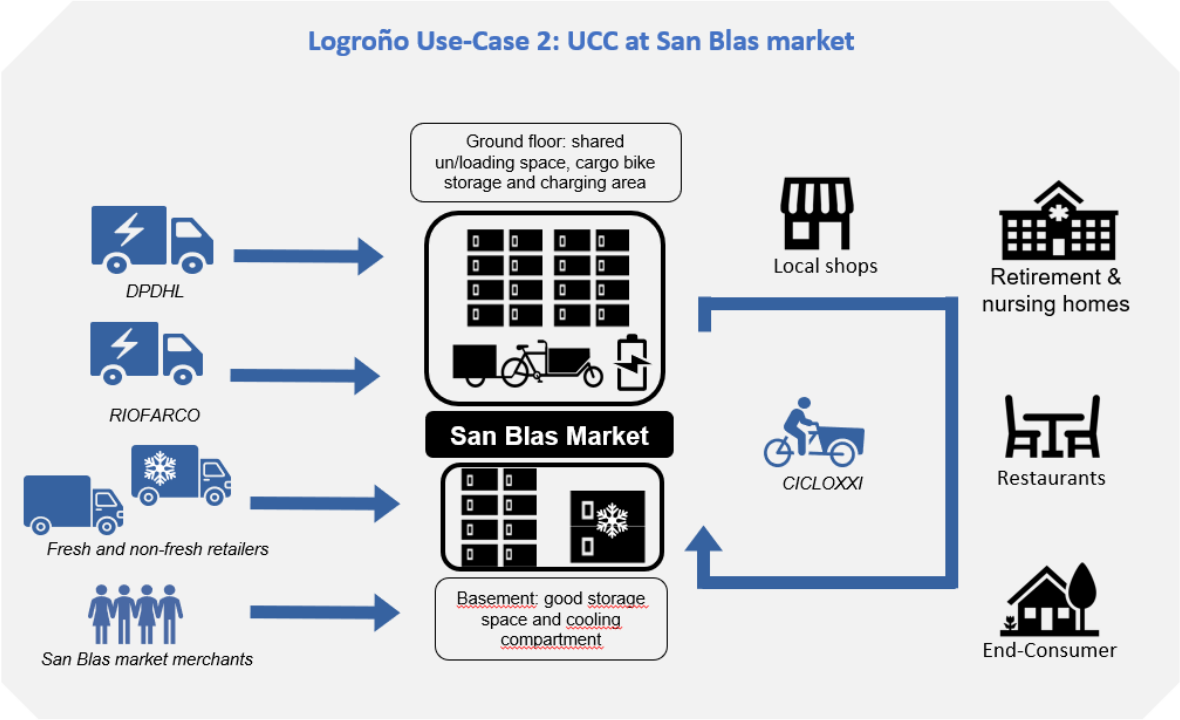


Figure 18: Living Lab Logroño - Visual of use case 2 (Source: LGN, 2024)

Use case 2.1 Logrono – Reverse logistic using San Blas market

The added-value for the use-case 2 could be integrating Reverse logistics for local HORECA commerce' waste (oil used, fish boxes of polystyrene and fruit boxes of wood), with multimodal transport (cargo-bikes and light vehicles). On the way back from goods delivery the logistic operator will pick up waste

from restaurants to store them in a separate are of the San Blas basement. Waste collectors will come and pick up waste becoming San Blas market as a green point for companies.

Figure 19: Living Lab Logroño - Visual of use case 2.1 (Source: LGN, 2024)

Use case 2.2 Logroño – Consolidation of community delivery service

Riofarco is currently consolidating products for pharmacies mostly (some B2C as well), leading to quite express / urgent deliveries with up to 20-30% empty space in the vans. They do not have electric vehicle in their fleet. Their current location is quite central (7 km to city centre), from where they operate three vans. They have internalised all their deliveries. Their average route is 16 km, and average delivery weight per pharmacy is around 10 kg.

When it comes to social deliveries, regulations foresee the employment of a specialised carrier, either because the goods treated are sensitive (Riofarco) or because of the assistant profile of the work (TSYS). This additional service to the San Blas hub could aim to consolidate deliveries to elderly homes including, pharmacies, orthopaedics and or food delivery utilizing the newly created consolidation area and implementing last mile delivery with cargo bikes. The idea is that instead of several operators and shops delivering goods individually, goods are delivered, consolidated and stored at San Blas according to their destination, from where goods are delivered by one operator using cargo bikes.

Figure 20: Living Lab Logroño - Visual of use case 2.2 (Source: LGN, 2024)

Use case 3 – Parcel locker network

To encourage citizens to explore the city center and shop in the local shops, Logroño will install parcel lockers near commercial areas of the city center and old town, in 3 different locations as well as refrigerated lockers in San Blas. The lockers will serve two main functions.

First, they will provide storage for citizens to store their bags or shopped goods, for up to 24h, while visiting the city or going to a restaurant. This will be a way to promote the combined entertainment of local shopping and restauration in a single trip to the center.

Second, they will allow local shops to sell goods outside opening hours by utilizing parcel lockers as self-service pick up stations. Shops can store the goods purchased online to be picked up by citizens.

The 100 tiendas merchants' association has shown interest in the lockers network.

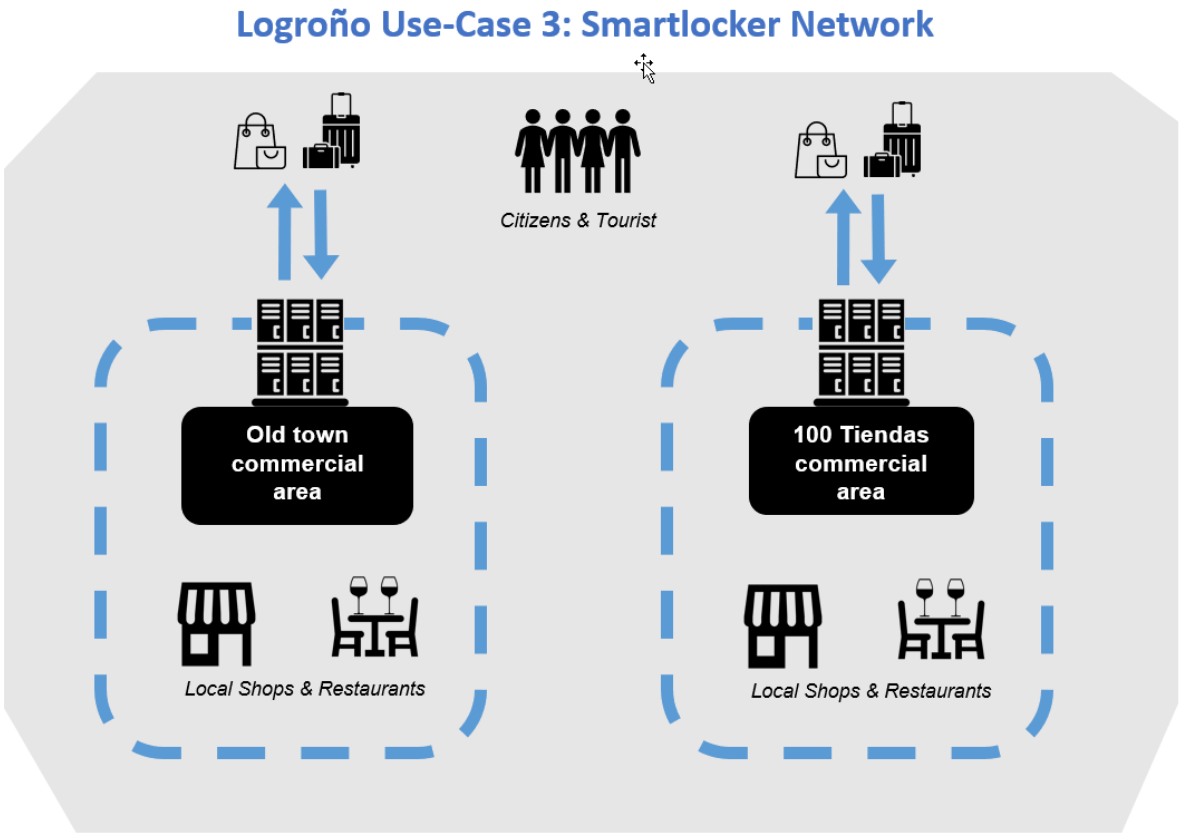


Figure 21: Living Lab Logroño - Visual of use case 3 (Source: LGN, 2024)

4.4 Outputs and following steps

As an output to this preliminary use case definition process, a more precise understanding of the level of interest and capabilities of the stakeholders identified in the first step was drawn. This laid the ground for a series of workshops to go deeper into the implementation roadmap definition, as described in the following section.

5 Implementation roadmap definition

5.1 Implementation roadmap workshop

For the implementation roadmap, the idea was to define for each Living Lab and use case, all essential steps and actions from the definition of the use case until the start of the demonstration phases. To ensure a clear structure, the action plan from T2.3 was used as a basis and has been expanded accordingly. The implementation roadmap contains an overview and a list of all the milestones and tasks from stakeholders' identification to the final training process, for instance ICT tools implementation, hub definition and vehicles preparation.

During the Workshop 3 "Use-Case Action Plan" from T2.3 which is described in detail in D2.2, the Living Labs prepared a first insight into the key factors for the Implementation period of the Use-Cases to prepare the following Workshop 4 "Implementation Roadmap" in T2.4.

This first brainstorm within WS3 was focused on kick-starting the process of creating an implementation plan, that smoothly connects to the "use case action plan" started during T2.3. Therefore, CBS in collaboration with LIHH designed a workshop activity aiming to outline foreseen risks, crucial stakeholders and milestones of the implementation phase.

The table below presents the dates and participants of Workshop 3, organised by each Living Labs, taking place between November 2023 and March 2024.

Living Lab	Date & Time	Number of attendees	Stakeholder present
Istanbul	18.02.2024	9	MIGROS, Iletmen, KARGOPARK
Hamburg	02.11.2023	10	District Hamburg-Mitte, Business Improvement District "Neuer Wall"
Logroño	08.03.2024	5	RIOFARCO, DHL
Nantes	02.11.2023	11	Les Boîtes à Vélo, Terre Azur / Pomona, HEPPNER, Atlantique Boissons, FFB

5.1.1 Tools and preparation

The workshop 3 activities were built around three brainstorming templates targeting different areas of interest. In the first step, stakeholders were asked to identify potential risks that could challenge or hinder the implementation. The second step focused on identifying crucial stakeholders that will be needed to ensure a successful Use-Case implementation. Finally, stakeholders were asked to identify important milestones to be considered and reached during the implementation phase. For each of the parts a separate template with a short instruction was provided by CBS. Each brainstorming was aimed to last around 5 minutes to collect ideas with sticky notes on the designated template. In a final review and discussion, all results were analysed, and the goal was to cluster the identified milestones to create a rough timeline of the implementation period.

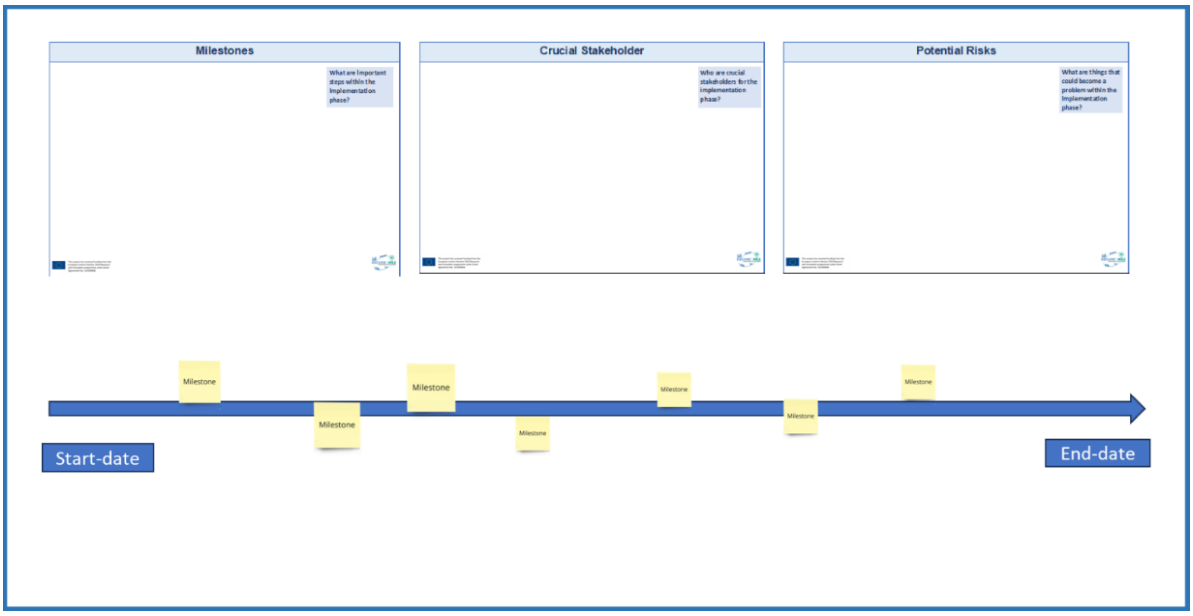


Figure 22: Brainstorm Exercise Templates (Source: CBS, 2024)

During an internal online workshop (23/10/2023) the Living Labs were introduced to the workshop's tools and activities and a first internal practice round was completed. During this internal workshop, each Living Lab not only got the chance to familiarise with the usability of the templates but also prepared first results to kick-start the external stakeholder workshops.

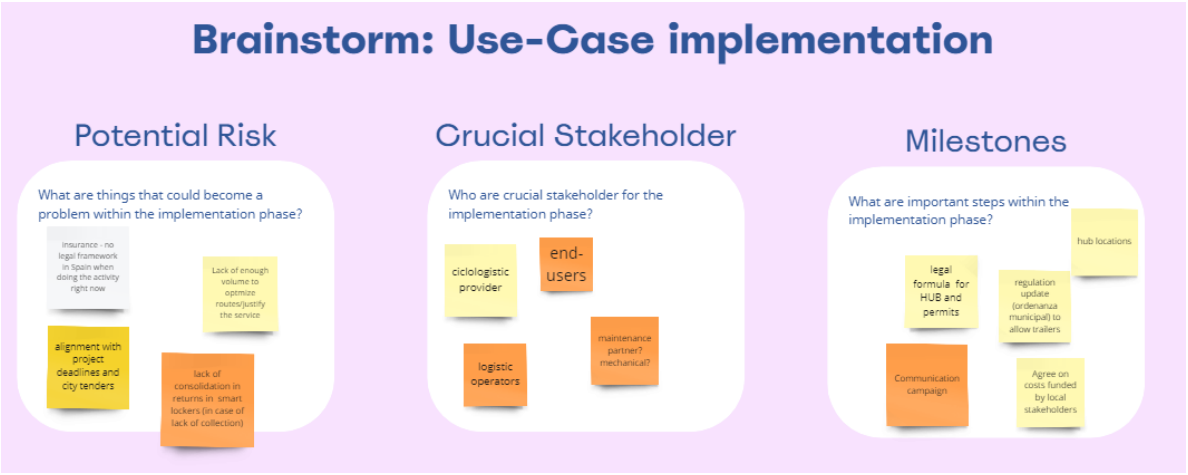


Figure 23: Screenshot from the use-case implementation brainstorm exercise (Source: CBS, 2024)

5.1.2 Individual workshop results from the Living Labs

A main part of task 2.4 has been to conduct stakeholders' workshops focusing on the integration of the implementation strategy of the identified use cases in each Living Lab within local, regional and national strategies. While workshop 3 was mainly focusing on finalizing objectives from T2.3, it was already setting up a base structure for the implementation phase in T2.4. Based on the results of WS3 Use Case Action Plan in each Living Lab, covering the necessary Milestones including relevant tasks within each Milestone of the Use-Case Definition.

The following tables give a comprehensive overview of the most relevant information for the use case implementation in the Living Labs. This includes potential risks, crucial stakeholders, implementation milestones and the timing of the implementation phase. With all the work that has already been put into account from the use case action plan, each Living Lab focused working the current actions for the use case and tries to think of the potential risks that lay may come in the future, thus setting a timeline with milestones that is needed for a successful implementation of the use case. This includes critical stakeholders, as well as potentially needed regulatory framework and adjustments, to secure the proper implementation of the use case.

5.1.2.1 Hamburg

With the above section in mind, the Hamburg Living Lab utilized the Milestone and Action Calendar created in task 2.3 to gather the necessary information. The aim was to identify all required actions from the use case implementation through to the demonstration phase. This includes outlining the necessary framework, anticipating potential obstacles, and setting timelines for when to address them.

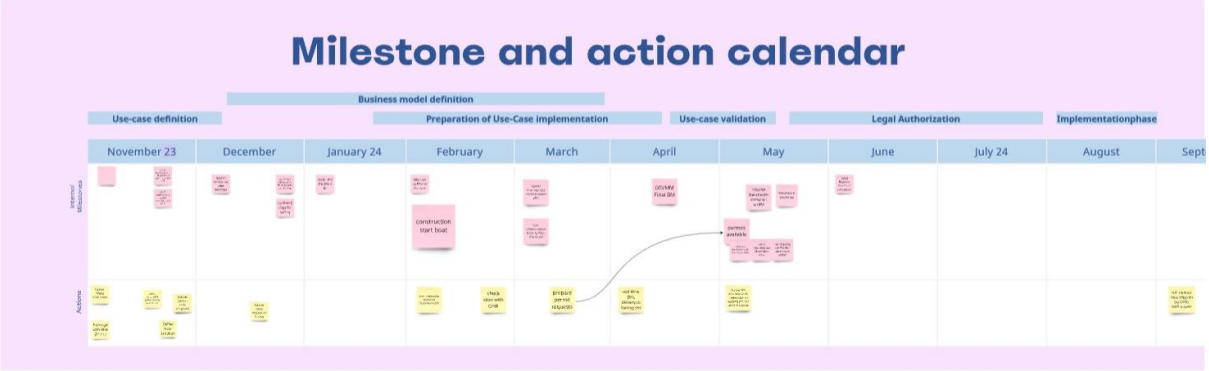


Figure 24: Milestone and action calendar from task 2.3 (Source: CBS, 2024)

Figure 25: Milestone and action calendar extension from task 2.4 (Source: CBS, 2024)

Use-Case Implementation	
Potential Risks What could become a problem within the implementation phase?	• Technical unsuitability of the barge • Dissatisfaction of DHL customers with delayed delivery • No sailing of the barge possible due to extreme weather or water conditions • Absence of the skipper, e.g. due to illness
Crucial Stakeholder Who are the crucial stakeholders for the implementation phase and why?	**Loading site** • Ruderverein Bille e.V. • Landesbetrieb Straßen, Brücken und Gewässer (LSBG, State Authority for Bridges, Roads and Waterways) **Unloading site** • District Office Hamburg-Mitte (Bezirksamt Mitte) • Heritage Conversation Office (Denkmalschutzamt) • Business Improvement District (BID) Neuer Wall • Ministry of Urban Development and Housing (coordinating the BID) • Ministry of Environment, Climate, Energy and Agriculture • Landesbetrieb Straßen, Brücken und Gewässer (LSBG, State Authority for Bridges, Roads and Waterways) **Route** • Hamburg Port Authority (providing data on water depths and tide forecasts) • Landesbetrieb Straßen, Brücken und Gewässer (LSBG, State Authority for Bridges, Roads and Waterways, operating the sluices)

	Freight • DPDHL **Monitoring and evaluation** • TUHH • DECARBOMILE technical partners
Implementation Milestones What are the most important steps within the implementation phase?	• Technical adaptation of the barge finalized • Necessary permits acquired • Skipper and additional skipper found and employed • Tidal based schedule for route and alternative route developed • Plan operative processes of logistics operator (DPDHL) • Order the bicycles (DPDHL) • Contractual agreements finalized • Alternative delivery solution in case of extreme weather or water conditions prepared • Technical adaptations on loading and unloading sites finalized • Skipper and additional skipper trained • DPDHL delivery personnel briefed and trained • Successful deployment of the barge in Hamburg • Successful test drive voyage of the barge • Successful maiden voyage of the barge, possibly with empty containers
Timing of the Implementation phase What is the planned time for the implementation phase?	The implementation phase is planned to start in month 19. 6 months are planned to gain the permits needed and a further 6 months are planned to implement structural adaptations at the on and offloading sites. The testing period of four months, preliminary during summer 2025, is planned with the barge in Hamburg. However, this is dependent on a number of issues to be resolved timely: • Technical adaptation of the barge • In agreement with OHB, the test period must be long enough for it to be worthwhile for DHL and for enough data to be collected

5.1.2.2 Istanbul

Use-Case Implementation	
Potential Risks What could become a problem within the implementation phase?	The rent budget defined to Migros for UCC will be used for construction works. The cost of the construction work to be carried out should not exceed the given rental budget.

Crucial Stakeholder Who are crucial stakeholders for the implementation phase and why?	İletmen is the stakeholder who will use UCC other than the consortium partner Migros. As it also distributes jointly with other companies within its own brand, İletmen works with other companies such as HepsiJet and Aras Kargo too.
Implementation Milestones What are the most important steps within the implementation phase?	İletmen – TMTX & team meeting Technical detail information of fleets Meeting with Istanbul Energy about the type of charging station needed
Timing of the Implementation phase What is the planned time for the implementation phase?	2025 – 2026

5.1.2.3 Logroño

Use-Case Implementation	
Potential Risks What could become a problem within the implementation phase?	• No cycle-logistics neutral operator (with capacity to consolidate goods of different operators). • Lack of experience in cycle-logistics. • No home delivery generalized in local stores. • Low level of digitalization of local stores. • Concerns on providing data. • Difficulty to find enough local stakeholders interested with enough volume. • Business model viability– economic viability might put in risk the installation of infrastructure and service. • Need of further awareness of benefits and volume capacity of caro bikes. • Lack of confidence from local stores in business model (at this stage) • Little referrals in national context. • Bureaucracy might delay processes and service implementation • Achieve an appropriated public space regulation.
Crucial Stakeholder Who are crucial stakeholders for the implementation phase and why?	• DHL • Riofarco • Local stores from historic center and 100 tiendas area • San Blas Market • Restaurants outside the city center • Jimenez Tagús •
Implementation Milestones What are the most	• Use of public space formula • Definition of ICT tools

important steps within the implementation phase?	• Data gathering • Timing of physical infrastructure and vehicles tenders • Ordinance for trailers use • Training (technological + cycle)
Timing of the Implementation phase What is the planned time for the implementation phase?	• Demonstration of the urban consolidation centre: Mar 2025 – Aug 2026 • Demonstration of the micro-consolidation centres: Sept 2025 – Aug 2026

5.1.2.4 Nantes

Use-Case Implementation	
Potential Risks What could become a problem within the implementation phase?	• Location availability during the implementation phase • Loss of the economic actors involved (cargo bikes) • Stakeholder engagement • Materials costs & rent increase
Crucial Stakeholder Who are crucial stakeholders for the implementation phase and why?	• Cycle operators: Boite à vélos, CoopCycle • UC1: Voyage à Nantes • UC2: SEMITAN • Logisticians, shoppers
Implementation Milestones What are the most important steps within the implementation phase?	• Kick-off • Environmental and economics follow-up • Evaluation

5.2 PRELIMINARY REGULATORY ANALYSIS WORKSHOP

Building on the identification of the needs and challenges, and the analysis of market opportunities in the local socio-economic contexts (see above, section 5.1.2), the following engagement phase with local stakeholders (workshop 4) aimed at identifying the key factors required in the urban logistic strategies and urban regulation frameworks (mobility, urbanistic) of each LL to feed the collaborative implementation strategy and to allow for the concrete implementation of the use cases.

These key factors were analysed by the municipalities considering their respective regional and national strategies and further explored with and validated by local stakeholders.

Thus, the WS4 process was structured in three different parts:

- (i) a preliminary analysis of the key success factors for implementation, based on the internal experience of IT,
- (ii) then an analysis per Living Lab of what was already existing and what was missing, and
- (iii) finally, the presentation of both results to the external stakeholders (logistic operators), to discuss the gaps identified and explore how to close them.

5.2.1 TOOLS AND PREPARATION

WS preparation

As a first step in the preparation of the WS4, a document exploring the different key regulatory factors for a successful implementation of decarbonated last mile solutions, modal shift and freight consolidation was elaborated, focusing on four elements:

- Urban planning,
- Local regulation frameworks,
- Supportive actions for modal shift and consolidation (strategic vision, incentives, etc.),
- EU regulations and SUMPs.

Urban planning documents, as the first tool used by local authorities to organise and plan the future of cities, should ideally dedicate in any structuring documents key actions to improve logistics operations, especially regarding space allocation in the city, including in the city centre. It is known that in every dense city, there are land use tensions, and a lack of available space for logistics operations is often noticed, with no urban planning document to support the implementation of logistics activities in the territory. This lack of interest in the subject from planning authorities can be explained by the negative aspect reflected by logistics activities, linked to negative externalities: i.e. congestion, noise pollution, GHG emissions, etc. Thus, it is necessary to change the perception of urban logistics and display inspiring examples and success stories, to advocate for space dedicated to logistics in cities.

Linked to this first key action, **supportive local regulations** should enable zero-emission deliveries as a competitive alternative. It has been demonstrated that vehicle restrictions regulations can promote 0-emissions transportation modes, load breaks and modal shift, by acting on three main elements:

1. vehicle gross weight,
2. vehicle motorisation,
3. time slots authorization.

In parallel, **positive discrimination** and facilitative regulations for cycle-logistics operators (longer access time to restricted areas, preferential rate for parking at unloading zone, temporary authorisation for public space occupation, dedicated itineraries for cargo-bikes, etc.), financial support, charter for sustainable urban logistics and open logistics data bases are additional elements which can provide a supportive framework to decarbonated solutions in the last mile.

Regulations at the European level can also have an impact on the development of urban logistics in European cities. Various regulations already exist, encompassing environmental legislation, energy policies, competition directives, cohesion and rural development funding, and transport policies. But the main document that can impact urban logistics at the city level is the **Sustainable Urban Mobility Plan (SUMP), and the more recent Sustainable Urban Logistics Plan (SULP).** No obligation is made to create this kind of documents, but each country can decide to make it mandatory for certain seize of city for example.

A successful development and implementation of a SUMP/SULP requires high levels of cooperation, coordination, and consultation across government levels and institutions. As the document focuses on meeting the mobility needs of residents, visitors, institutions, and companies in the urban area, it ensures public acceptance, support, and minimizes political risks by involving citizens and stakeholders in planning enhances.

WS tools

Based on this first analysis of the key regulatory success factors, municipalities were asked to fill-in the following table, assessing where they stand in terms of supporting policies based on the different categories identified in the WS preparation, before organising the workshop with external

stakeholders. The aim was to have a clear picture of the regulations needed for the use case implementation, the ones already in place, the ones missing and how to bridge the gap.

Type of actions	Document / policy that can provide this action	Is it needed for your Use Cases?	If yes, is it already provided for?	If not in place at the moment, how to close the gap?
Urban planning				
Coherent network of logistic spaces		☐	☐	
Public space allocated for logistics activities		☐	☐	
Cycle-logistics operations integrated in urban planning documents		☐	☐	
Rider training schemes and on-street parking spaces for cargo-bikes		☐	☐	
Regulation framework				
Vehicle weight restriction		☐	☐	
Vehicle motorisation restriction		☐	☐	
Time slot restriction		☐	☐	
Positive discriminations for green delivery vehicles		☐	☐	
Financial support (loans, special rate, etc.)		☐	☐	
Facilitative regulations for cycle-logistics operators		☐	☐	
Authorisation of parcel lockers implementation on public space		☐	☐	
Supportive actions for urban logistics				
Strategic vision for goods mobility in the city				

Charter for sustainable urban logistics		☐	☐	
Data base for city logistics and network of relevant stakeholders		☐	☐	
Concerted actions and transversal strategy between urban planning and transport organisation		☐	☐	
Local Semi-Public Company (for Public Service Delegation, etc.)		☐	☐	
Adopt a clear strategy for parcel lockers on public space		☐	☐	
Different incentives				
Specific technical clause on delivery by cargo bikes or any other green mode of delivery for public procurement		☐	☐	
Rider training schemes		☐	☐	
Facilitative process to allow public space occupation		☐	☐	
Promote cargo-bikes as preferred option for restricted areas in the city, based on sector needs and flows requirements		☐	☐	
Promote the implementation of multi-operators' parcel lockers		☐	☐	
Communication and visibility				

Communication plan about CO2 emissions of road transport to promote greener delivery system		☐	☐	
Safety standard / label for cargo-bikes operators that adopts the best practices.		☐	☐	

5.2.2 Individual workshop results from the Living Labs

Based on this preliminary internal regulatory assessment, the Living Labs then organised WS4 with their external local stakeholders. The workshop had the following aims:

1. Review the implementation roadmap elaboration and the related action plan
2. Review the defined use cases (list all actions needed, validate type of hubs and deployment areas, ensure ICT tools integration)
3. Review the integration into regional and national strategies

On this last point, municipalities presented to external stakeholders the current urban logistics strategies and regulation framework already in place, as well as the future laws, regulations, and urban planning decisions that need to be passed or made for the successful implementation of the use cases.

5.2.2.1 Hamburg

All documents / policy needed for the use cases' actions are already in place. The following regulations are identified as key for the successful use case's implementation:

- Hamburg Climate Plan policy
- Hamburg strategy for decarbonisation in the urban logistics sector: Green subgoals for mobility in Hamburg
- Focus on development of cargo-bike solutions
- Communication from the Senate to the Parliament: Mobility transition strategy, in particular Section 4.8.2 Urban freight transport and optimization of the last mile
- Regulations for inland navigation and waterway transport

To be noted that parcel lockers are not allowed on public ground, which is a hindering regulation for the use case implementation in Hamburg.

5.2.2.2 Istanbul

Documents / policy needed for the use cases' actions are either already covered by existing regulations (SUMP, vehicle restriction, etc.) or will be in upcoming regulations (such as for example in the Istanbul Logistics Master Plan, which is still under discussion) or in the frame of the project (allocation of public space for logistics activities, coherent network of logistic spaces). However, a few elements were missing but will not be covered as part of the project because the concepts are not yet defined in the legislation:

- Positive discriminations for green delivery vehicles,
- Facilitative regulations for cycle-logistics operators.

5.2.2.3 Logroño

Most documents / policies needed for the use cases' actions are in place. The future mobility ordinance will close the remaining gaps, mostly concerning vehicle motorisation restriction (including positive discriminations for green delivery vehicles and cargo bikes) and cooperation between municipality departments (through the Sustainable Urban Mobility Plan, or SUMP).

Furthermore, DECARBOMILE will aim to improve the database, develop rider training schemes, as well as adopt a clear strategy for parcel lockers on public space.

During the external WS, the following regulations were identified as necessary:

- A new ordinance to rule transit and access in sensitive zones (old town),
- A new definition of vehicles' typology,
- Economic incentives to promote this type of delivery service,
- A national mobility law.
-

5.2.2.4 Nantes

All documents / policies needed for the use cases' actions are already in place. The communication around the benefits of cycle logistics could be strengthened by the metropolis, by promoting cycle-logistics as the preferred option in restricted areas of the city to Logistic Service Providers. The external stakeholders identified two other regulations which could be reinforced for better use case implementation: more access regulation for ICE (internal combustion engines) vehicles and a change of regulation regarding waste collection for small companies.

When it comes to the use cases' implementation, the stakeholders expressed needs concerning fresh food flows, with the identification of the volumes which can be transferred to cycle-logistics, linked to a seizing of the cold storage needed and a public grant from the metropolis to implement the storage needed in the cycle-logistics hubs.

6 INTEGRATION OF ICT/IOT SOLUTIONS IN THE USE CASES

This section outlines the strategy for the integration and implementation of Information and Communication Technology (ICT) tools and Internet of Things (IoT) solutions within the defined use cases. The aim is to enhance the efficiency and effectiveness of delivery operations through the strategic deployment of advanced technologies. The integration process will involve internal and external key stakeholders and technical consortium partners to ensure a seamless implementation. The technical responsibilities have been distributed in five main categories according to the levels of operation that the DECARBOMILE project should support:

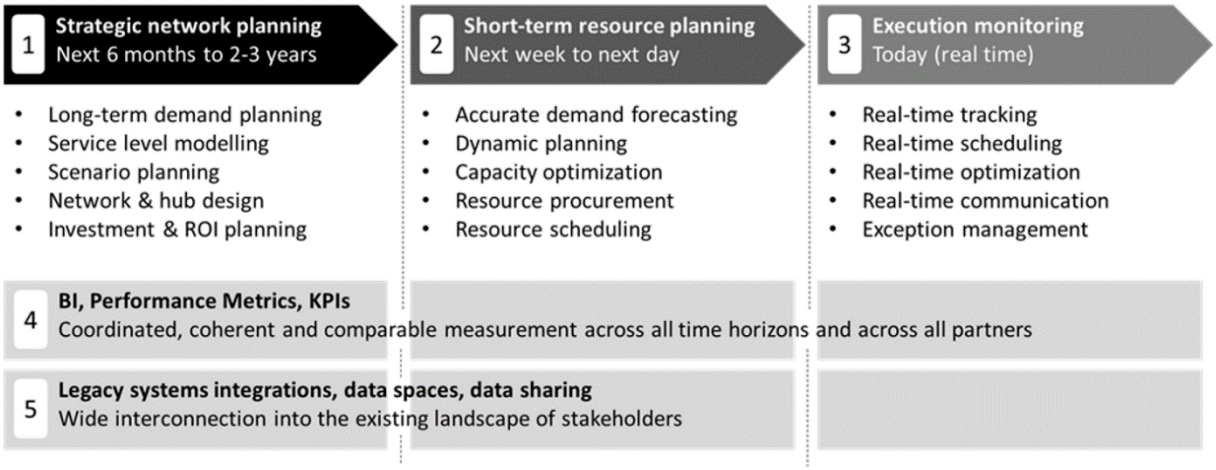


Figure 26: System Operational Levels (Source: TMTX, 2024)

To decide and divide the roles and the responsibilities between the technical partners, the following four Technical Focus Groups have been created to support the use case definition and ICT tools needs identification per LL:

- Logroño: CAPIT, ITA, NGS, INT
- Hamburg: GGI, NGS, ITA, OHB
- Istanbul: TMTX, GGI, SCU, FLEX
- Nantes: IMT, CAPIT, ID4M, FLEX, IT

The focus groups have been working closely with the key stakeholders in the different LLs to ensure a smooth collaboration between the technical partners, local municipalities, logistic operators and other stakeholders.

6.1 ICT/IoT TOOLS INTEGRATION PLAN

The current ICT/IoT tools integration plan focuses on assessing current delivery systems, engaging stakeholders, selecting appropriate technologies, and implementing comprehensive solutions tailored to each LL unique needs and utilizing the specific capabilities of the technological partners.

The initial phase involves a thorough analysis of existing operations to identify inefficiencies and gather data. Engaging local stakeholders ensures that their requirements are met, and the project objectives are aligned. A flexible implementation roadmap with defined milestones and timelines is then developed.

Next, suitable ICT tools and IoT solutions are identified and customized to fit specific operational environments. The next phases will involve pilot tests to validate their effectiveness, leading to full-

scale implementation with continuous monitoring and support. Stakeholders will receive training and ongoing technical assistance to ensure smooth adoption and improvement.

The implementation plan for integrating ICT and IoT tools into delivery operations will proceed through several key phases: Assessment and Planning, Technology Selection and Customization, Implementation and Testing, and Stakeholder Support. Each phase is designed to ensure a thorough analysis of current operations, engagement with local stakeholders, careful selection and adaptation of appropriate technologies, comprehensive testing and rollout of solutions, and continuous support and training for all users.

Phase 1: Assessment and Planning

Needs Assessment:

- Conduct a comprehensive analysis of current delivery operations to identify inefficiencies and areas for improvement.
- Gather data on existing processes, technologies, and infrastructure in each LL.

Stakeholder Engagement:

- Engage with local stakeholders, including delivery companies, municipal authorities, and end-users, to understand their specific needs and requirements.
- Facilitate workshops and meetings to align on project objectives and expectations.

Roadmap Development:

- Develop a detailed implementation roadmap with clearly defined milestones, deliverables, and timelines.
- Ensure the roadmap is flexible to accommodate the unique requirements of each LL and to meet the needs of newly identified stakeholders.

Phase 2: Technology Selection and Customization

Tool and Solution Identification:

- Identify ICT tools and IoT solutions that best fit the needs of each LL, considering the available technical capabilities of the technical partners.

Customization and Integration:

- Customize selected tools and solutions to fit the specific operational environment and requirements of each LL.

Phase 3: Implementation and Testing

Implementation:

- Based on pilot test results, roll out the solutions across all delivery operations in each LL.
- Implement continuous monitoring and support mechanisms to address any emerging issues promptly.

Initial real-life testing:

- Conduct real life tests to validate the effectiveness and reliability of the solutions.
- Collect feedback from the local stakeholders to identify any issues or areas for improvement.

Integration and pilot testing:

- **ICT/IoT Tools Integration:** Integrate ICT and IoT tools into different data spaces allowing data sharing for wide interconnection into the existing landscape of stakeholders.
- **Automated Testing:** Create an automated testing framework with specific software test cases to ensure the seamless operation of integrated tools and identify any issues that need addressing.

Phase 4: Stakeholder Support

Ongoing Support:

- Demonstration and training for all users of the new systems.
- Adoption of support to provide ongoing technical assistance and maintenance from the technical partners.

To ensure a smooth and efficient integration of ICT tools and IoT solutions across the LLs, an ICT tools matrix that delineates the responsibilities of each technical partner has been created. The matrix is a structured framework that assigns the development responsibilities of the ICT tools to the technical partners and is designed to address the specific needs of stakeholders in each LL by leveraging the expertise of technical partners. The ICT Tools Matrix shows the different ICT tools that will be developed in each LL and which partner will develop them:

LLs	T&T&M Real-time Transport. Monitoring	Dynamic E-Routing	Load Optimization	Load Pooling	Network Design	Forecast & Optimization	Digital Urban City Models
Hamburg	YES NGS/GGI	NO	NO	NO	NO	TBD TMTX *Potentially in WP6	YES ITA
Logroño	YES NGS/GGI/ CAPIT	YES GGI/CAPIT	TBD GGI *Potentially in WP6	NO	TBD IMT/GGI *Potentially in WP6	TBD TMTX *Potentially in WP6	YES ITA
Nantes	YES NGS/GGI	TBD GGI *Potentially in WP6	TBD GGI *Potentially in WP6	NO	YES IMT/GGI	YES TMTX	YES ITA
Istanbul	YES NGS/GGI	YES GGI	YES GGI	YES SCU	TBD IMT/GGI *Potentially in WP6	YES TMTX	YES ITA

Figure 27: ICT Tools Responsibility Matrix (Source: TMTX, 2024)

6.2 Brief descriptions of the ICT tools

A) Track & Trace & Monitoring Solution (T&T&M)

The track & Trace & Monitoring T&T&M solution encompasses the utilisation of physical devices (sensors) designed to facilitate the seamless collection and preliminary analysis of data. This solution, innovatively developed by NGS, leverages a range of commercial devices provided by partners companies to ensure robust and efficient data capture.

The T&T&M solution is designed to address critical logistical and operational questions that are essential for effective supply chain management. Among these questions are:

- What are the dimensions of each shipment?
- Where are the goods/packages?
- Are the required environment conditions maintained (temperature, humidity, motion, etc.)?
- Possibility to monitor the shipments online (web, mobile app).

B) Real-time Transportation Monitoring

The real-time transportation monitoring, developed by GGI, is an advanced solution designed to enhance the efficiency and transparency of transportation operations by utilizing data generated from sensors supplied by NGS. This cutting-edge system addresses critical logistical concerns by providing real-time answers to essential questions such as:

- Where are currently the vehicles? Are they on schedule?
- Are optimal conditions maintained (e.g. temperature for refrigerated shipments)?
- Real-time tracking of deliveries and sensor data.
- KPIs monitoring and reporting using the aggregated data for future analysis.

C) Load Optimization and Dynamic Routing

Load Optimization

The purpose of the load optimization tool, developed by GGI, is to assign parcels to cargo-bikes and mobile hubs in an optimal way. At first stage, the optimisation is planned in advance based on the list of orders to be delivered. In a second stage, real-time re-optimisation is evaluated based on deliveries and collections made.

Dynamic Routing

Dynamic routing is another tool developed by GGI, which refers to an advanced solution that adapts vehicle routes in real-time based on various factors such as urban context, vehicle specifics, and real-time traffic conditions. In the DECARBOMILE project, this involves integrating data from tracking devices and sensors on vehicles and using this data to manually or automatically adjust routes for optimal delivery efficiency.

Generally, load optimization and dynamic routing answer the following questions:

- How many vehicles are needed to carry out the deliveries?
- Calculate the optimal route for each vehicle (maximize/minimize different KPIs, e.g. various combinations between distance/time/cost vs. service level)
- Consider various constraints (capacities, delivery time slots / deadlines, zones etc.)

D) Demand Forecasting and Optimization Algorithms

The demand forecasting algorithms developed by TMTX leverage the power of AI and mathematical modelling to accurately predict transport demand at local scales. These forecasts enable the creation of delivery plans and routes in advance, ensuring that operations are prepared to meet anticipated demand. Following this, optimization algorithms are applied as a second step, using the forecasted demand as input. This optimization process is designed to enhance operational efficiency, potentially leading to reduced environmental impact and lower costs. The tools developed by TMTX help companies answer the following questions:

- How many parcels will need to be delivered each day? Where? What transport capacity is required?
- Use historical data to predict the demand in the coming week(s)
- Forecast per hub and delivery zip codes

- Produce the delivery plans and routes in advance based on the forecast
- How operations can be optimized for better efficiency

E) Network Positioning

The network design decision support system, developed collaboratively by GGI and IMTA, is a multi-level tool designed to optimize city logistics networks by considering various tiers of logistic facilities. GGI is responsible for the overall software design, backend development, and user interfaces, while IMTA focuses on creating optimization algorithms that assist in making and evaluating network design decisions. The user interface, currently being refined by GGI, will be tailored to effectively display the algorithmic results and adapt to the urban context of the DECARBOMILE project. It addresses the following questions:

- How many and what type of logistic units are needed? Where to locate them?
- Simulate deliveries of shipments for different hub locations and combinations
- Consider constraints such as low emission zones, fleet size, vehicle capacity, facilities
- Estimate the distribution cost and profits for different scenarios (number and location of hubs, fleet size)
- Simulate collaborative strategies and the impact on all of them

F) Load Pooling

Load pooling, as developed by SCU, centres on integrating receivers into the consolidation process by coordinating them with logistics service providers through advanced information and communication technologies. This strategy enhances flexibility in managing urban freight demand, optimizing efficiency for both Business to Business (B2B) and Business to Customer (B2C) deliveries, without imposing restrictions on industry stakeholders. The tool has the following characteristics:

- When a delivery is planned, the application detects and informs other potential stakeholders and allows them to participate in the same delivery.
- The route is dynamically recalculated when new participants join.
- Cost benefit – all stakeholders, who participate in the shared delivery, share the delivery cost.

G) Digital City Models

The digital city models solution, developed by ITA, involves creating advanced urban models tailored to Living Labs, designed to monitor and evaluate city operations. These models simulate various aspects of city transportation, including vehicle movement, order processing, and interactions between entities. Using multi-agent simulation technology, the models replicate real-world scenarios to automate planning and optimize operations. The solution also integrates cleaned and transformed city data, ensuring accuracy and consistency for more reliable simulations and decision-making. The main purposes of this solution are:

- Visualisation of the city dynamics and ICT solutions implemented
- Preparation for the digital twin solution

6.3 ICT TOOLS INTEGRATION IN HAMBURG

LLs	T&T&M Real-time Transport. Monitoring	Dynamic E-Routing	Load Optimization	Load Pooling	Network Design	Forecast & Optimization	Digital Urban City Models
Hamburg	YES NGS/GGI	NO	NO	NO	NO	TBD TMTX *Potentially in WP6	YES ITA

Figure 28: ICT Tools Responsibility Matrix HAM (Source: TMTX, 2024)

The ICT tools being developed in Hamburg include the T&T&M system, which will oversee the movement of goods on the electrical barge, and real-time transportation monitoring specifically designed for tracking the travel of OHB electrical vehicle. These tools are intended to enhance logistical efficiency and environmental sustainability by providing comprehensive monitoring and real-time updates. The city digital model was also developed by ITA.

Initially, there was no defined use case for implementing the TMTX forecasting solution in Hamburg, but in the final months of WP3, the potential utility of forecasting the travel patterns of the urban electric vessel was identified. This task would involve considering a range of external constraints, such as weather conditions, water traffic, tides, and other environmental factors. Although this request emerged towards the end of WP3 and lies beyond its original scope, it will be analysed later during the project and if it's technically feasible, may be implemented during the demonstrations phase.

More detailed information about the progress on the ICT tools development in Hamburg can be found in WP3 deliverables: D3.1 Optimised tracking tools and D3.2 Innovative routing, planning, load optimisation, load pooling, network design algorithms, and urban models. Additionally, insights into specific applications and functionalities can be found in the "ICT tools detailed description" annex of the Hamburg use case definition sheet. These resources provide comprehensive coverage of the advancements and implementations in tracking, routing, and urban logistics solutions.

6.4 ICT TOOLS INTEGRATION IN ISTANBUL

LLs	T&T&M Real-time Transport. Monitoring	Dynamic E-Routing	Load Optimization	Load Pooling	Network Design	Forecast & Optimization	Digital Urban City Models
Istanbul	YES NGS/GGI	YES GGI	YES GGI	YES SCU	TBD IMT/GGI *Potentially in WP6	YES TMTX	YES ITA

Figure 29: ICT Tools Responsibility Matrix IST (Source: TMTX, 2024)

Istanbul stands out as a frontrunner in the adoption of ICT tools, largely due to the proactive involvement of our internal partner MIGROS, who provided valuable data for analysis early in WP3. This early data contribution was instrumental in shaping the project's progress. In addition, Istanbul successfully engaged an external stakeholder, Iletmen, who provided historical data by the end of WP3, further enriching the data availability and enabling a more comprehensive analysis.

As a result of these collaborative efforts, we expect to see the deployment of the full range of advanced ICT solutions in Istanbul. This includes the implementation of: T&T&M systems to oversee goods movement, real-time transportation monitoring for tracking deliveries, dynamic routing solutions to optimize delivery paths, load optimization techniques to enhance freight efficiency, load pooling strategies for delivery consolidation, forecasting and optimization algorithms to predict and plan logistics needs, and digital city models to simulate and analyse urban logistics.

Additionally, the network design tool will be also tested in Istanbul, though this will occur after the completion of WP3.

More detailed information about the progress on the ICT tools development in Istanbul can be found in WP3 deliverables: D3.1 optimised tracking tools and D3.2 Innovative routing, planning, load optimisation, load pooling, network design algorithms, and urban models. Additionally, insights into specific applications and functionalities can be found in the "ICT tools detailed description" annex of the Istanbul use case definition sheets. These resources provide comprehensive coverage of the advancements and implementations in tracking, routing, and urban logistics solutions.

6.5 ICT TOOLS INTEGRATION IN LOGROÑO

LLs	T&T&M Real-time Transport. Monitoring	Dynamic E-Routing	Load Optimization	Load Pooling	Network Design	Forecast & Optimization	Digital Urban City Models
Logroño	YES NGS/GGI/ CAPIT	YES GGI/CAPIT	TBD GGI *Potentially in WP6	NO	TBD IMT/GGI *Potentially in WP6	TBD TMTX *Potentially in WP6	YES ITA

Figure 30: ICT Tools Responsibility Matrix LGN (Source: TMTX, 2024)

The identification of use cases in Logroño experienced significant delays, leading to several strategic adjustments throughout the project. This has resulted in a corresponding delay in the identification and tailored development of ICT tools for this Living Lab. The initial strategy, which faced multiple changes, impacted the timeline for fully implementing and customising these tools.

Despite these setbacks, CAPIT, NGS, and GGI collaborated closely with DHL Spain, an external stakeholder from Logroño, to progress the development of ICT solutions. They successfully installed tracking sensors for T&T&M, which initiated data collection and allowed for preliminary conceptualisation and testing of real-time transportation monitoring and dynamic routing solutions. ITA also contributed by developing the digital city model for Logroño. Furthermore, as WP3 progressed, it was determined that the municipality would acquire and operate electric bikes, prompting NGS to supply the necessary tracking devices for these new assets. While additional potential use cases may benefit from other ICT tools such as load optimization, network design, and forecasting and optimization algorithms, the detailed identification and development of these tools are expected to occur after the conclusion of WP3.

More detailed information about the progress on the ICT tools development in Logroño can be found in WP3 deliverables: D3.1 Optimised tracking tools and D3.2 Innovative routing, planning, load optimisation, load pooling, network design algorithms, and urban models. Additionally, insights into specific applications and functionalities can be found in the "ICT tools detailed description" annex of the Logroño use case definition sheets. These resources provide comprehensive coverage of the advancements and implementations in tracking, routing, and urban logistics solutions.

6.6 ICT TOOLS INTEGRATION IN NANTES

LLs	T&T&M Real-time Transport. Monitoring	Dynamic E-Routing	Load Optimization	Load Pooling	Network Design	Forecast & Optimization	Digital Urban City Models
Nantes	YES NGS/GGI	TBD GGI *Potentially in WP6	TBD GGI *Potentially in WP6	NO	YES IMT/GGI	YES TMTX	YES ITA

Figure 31: ICT Tools Responsibility Matrix NANTES (Source: TMTX, 2024)

The development and implementation of ICT tools in the NANTES LL have faced significant challenges due to delays and ongoing changes in the use case definition, external stakeholder engagement, and overall approach. These shifts have led to considerable setbacks in identifying the appropriate ICT tools and consequently delayed their development and deployment.

Despite this, progress has been made towards developing and implementing ICT tools. Late in WP3, we successfully obtained some data samples from TRI, a consortium partner, and from Atlantique Boissons, an external stakeholder, although the latter's contribution was limited to one technological partner, IMTA. This data has enabled us to begin testing the network design and forecasting and optimization solutions. Additionally, NGS supplied sensors for TRI vehicles, allowing us to initiate testing of the T&T&M and real-time transportation monitoring solutions. With the availability of this data, GGI plans to test dynamic routing and load optimization solutions after the conclusion of WP3. The digital city model for Nantes is also complete and will be enhanced with the newly acquired data to provide a more comprehensive simulation and analysis of urban logistics.

More detailed information about the progress on the ICT tools development in Nantes can be found in WP3 deliverables: D3.1 Optimised tracking tools and D3.2 Innovative routing, planning, load optimisation, load pooling, network design algorithms, and urban models. Additionally, insights into specific applications and functionalities can be found in the “ICT tools detailed description” annex of the Nantes use case definition sheets. These resources provide comprehensive coverage of the advancements and implementations in tracking, routing, and urban logistics solutions.

7 CONCLUSION

This deliverable **D2.1 Implementation roadmap** presented the implementation roadmap for setting up the ten use cases in the four LLs of DECARBOMILE. This roadmap includes the activities, carried out by the municipalities (e.g. development of use case, stakeholder engagement, construction, funding, access to data), logistic operators (e.g. setting up of the operational processes) and the technical partners (e.g. developing ICT/IoT tools to support the use case implementation).

It includes the methodologies (Stakeholder Mapping and Management Cycle, Use Case Definition and Workshops) used to support the LL in developing the implementation roadmap.

For the **stakeholders mapping**, the stakeholders needed to be identified and mapped according to their priority for the use case in order to derive engagement strategies. It could be shown that this is an ongoing process and needs to be done during the whole use case development and implementation process. For the workshops it is important to prepare documents to support the LL in facilitating the workshops with local stakeholders in the local languages. The scopes of the workshops need to be clear to all participants, so that the results can be used for the project.

For the **use case definition**, a clear picture of the current baseline situation is helpful to identify the challenges of LML in the LL and its logistics model and derive optimization potential for the use case. This helps to determine the relevant stakeholders and needed actions. In order to make the use case economic viable, the identification of added value services such as parcel lockers, charging stations or repair stations is helpful.

The use case development was an ongoing process in the first 24 months. At the beginning, three use cases have been identified in Hamburg, while only one (Multimodal delivery (water barge and cargo bikes)) will be tested in the end, because the other two (Reverse logistic using the barge and Additional stop on the route) have just been an extension of the first use case, that cannot be done because of limited barge capacities and the low reliability of the first route planned. In Istanbul, three use cases (Enhancing MIGROS operations, Collaborative UCC and SCU load pooling algorithm testing) will be tested, while the water-cargo bike interoperability had to be cancelled. In Logrono, four use cases (Logistic consolidation in MCC placed on public parking, MCC at San Blas market and Lockers network) will be tested, while the community service use case is on hold and the two use cases (Transportation of old people with cargo-bikes and Train-cycles and bus-cycles intermodality) have been cancelled. For Nantes, several use cases have been discussed. There are three active use cases (leveraging existing logistics operations through ICT tools, hybrid logistic space for pros and citizens on public space, micro hub on public space), while the logistics activities on public parking are on hold. Five use cases have been cancelled (reverse logistics, river logistics, shared hub in the pedestrian area of Parc des Chantiers, logistic activities in bus depot).

During the use case development, several challenges have been encountered. A lot of them are in terms of infrastructural conditions (missing space, condition of the infrastructure…) difficulty to find external partners for the project, budget issues (higher cost due to inflation, allocation of cost in shared facilities) and concerns regarding the economic viability of the use case and the integration of new ICT tools.

In order to analyse the stakeholders, the stakeholder have been clustered in different categories (end consumer-B2B, local economic actors (Transport and logistics operators, craftsmen trade companies), federations and associations and local/governmental authorities and real estate and infrastructure). Furthermore, it has been identified, how easily the stakeholders can be reached, how likely it is, that the join the project and which value the stakeholder has for the project.

As key stakeholders in all living labs, the transport and logistics operators, citizens, B2B consumers and local governmental authorities have been identified.

After identifying the stakeholders and developing the first drafts of the use cases, the implementation roadmap has been defined in several workshops with local stakeholders involved in the different use cases. For all use cases the actions, needed to set up the use case, have been determined. For all actions, the corresponding milestones and partners responsible for it and potential risks have been identified. As the implementation of new logistics practices could make new regulations necessary, the key factors in terms of urban planning, local regulation frameworks, supportive actions for modal shift and consolidation and EU regulations and SUMPs required in the urban logistic strategies and urban regulation frameworks were developed during workshops. For each key factor and corresponding action, the LL checked, if the action is needed for the use cases and if it is already provided or need to be developed. The analysis showed, that most or all documents/policies needed for the implementation of the use case are already in place.

As some of the use cases are setting up hubs (Micro hub, MCC, UCC), six key factors (vehicle circulation (slopes and gyration), headroom height, vehicle parking, handling and operations space, horizontal and vertical movement (lifts, …) and fire safety and security rules) with predefined characteristics (heights, weights, ratios etc) have been developed that need to be respected by any potential hub location.

All use cases are using cargo bikes for the last mile delivery. For this, a technical visit in Spain has been organized to support the development of cycling strategies, infrastructure and policies related to last mile decarbonisation. From this workshop, three needs could be identified (Clarification regarding regulations, vehicles requirements and circulation restrictions to operate cycle logistics and adjust local ordinance if necessary, need of legal advice to municipalities that want to proceed with legal procedures to make public space available to implement cycle logistics, need of support (infrastructure and financial support) from public administration to cycle logistics operators during at least the three first years of activity)), that will be used for developing new guidelines for authorities.

Another core aspect for the implementation is the use of ICT/IoT tools in the different LL. In order to develop and use the right tools for the Use Cases, a four-phase approach has been followed (Assessment and Planning, Technology Selection and Customization, Implementation and Testing and Stakeholder Support). In total, seven ICT tools are developed and tested during the Decarbomile Use Cases. The T&T&M Real-time monitoring, the dynamic routing and the digital urban model will be tested in all LL. The Load optimization and network design will be tested in two to three LL, the forecast and optimization tool will be tested in one to three LL and the load pooling in one.

The development of the implementation roadmap for Decarbomile showed the complexity of the last mile logistics operations. Therefore, it is crucial to include relevant stakeholders early enough in the process. It could be seen that the implementation of the Use Case is not linear and needs several iterations/tests while including many different stakeholders. The Use Case Definition is the key and has a high impact on the overall project progress. Because the Use Case definition can change due to several reasons, it is important to keep the Use Case Definition Documents Up to date. Changes need to be communicated to all relevant stakeholders and work packages. The setting up a focus group with the technical partners involved in the different use cases helped to ensure the development of ICT/IoT tools, that fulfil the needs of the use cases

ANNEXES

USE CASE HAMBURG – DETAILS

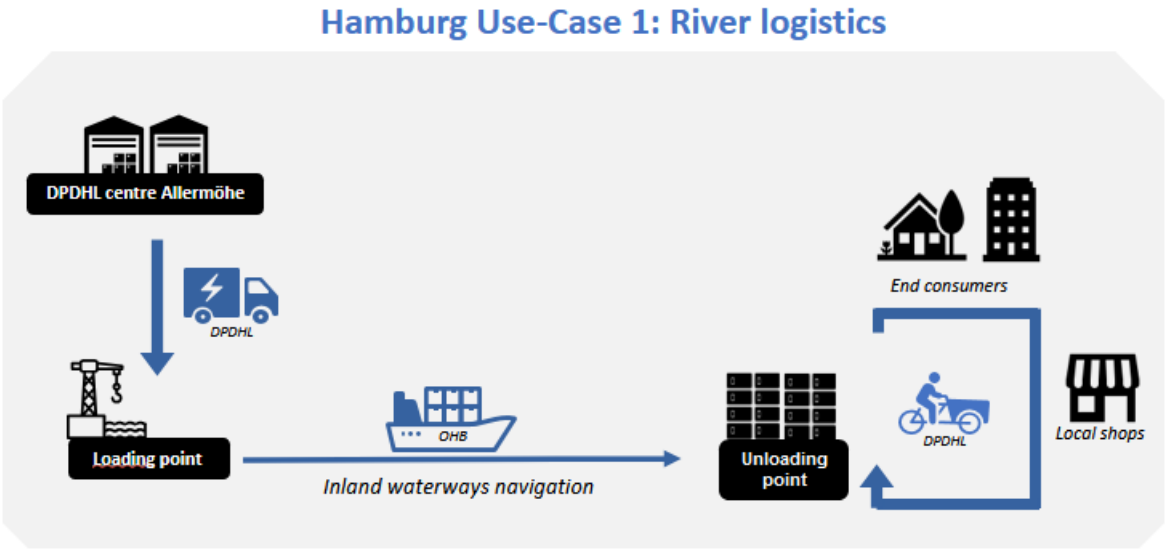


Figure 32: Visual of the use case (Source: IT, 2024)

A) Baseline situation

DPDHL currently have around six employees dedicated to delivering to the area of Neuer Wall-Stadthausbrücke-Jungfernstieg every day. Around 150 to 200 parcels are delivered per day and per employee, using IVECO thermal trucks with a load capacity of 18m3.

B) Use case situation

The LL will focus on using the waterways and canals from the Billbrook district, a major industrial and commercial location in Hamburg, and the city centre. The loading point will be in b. d. Grünen Brücke 3 and the unloading point will be located at the sluice "Schaartorschleuse".

At the unloading station, the possibility of installing a micro-hub / DHL container is being explored.

A total of 4-5 delivery staff will deliver 12 containers per day (Monday to Saturday = 6 days a week) to the customers (private and companies) located there. The barge is expected to arrive at the unloading point by 11am at the latest (leaving the warehouse around 8am), to provide customers with a quality delivery service. 3 to 4 DHL cargo-bikes with a loading capacity of 1.8m3 are planned to be delivered to the Neuer Wall area. This type of cargo-bike has mobile parcel containers attached to the vehicles that can be stored if needed. In this use case, 12 parcel containers are foreseen and would be stored in two micro-hubs.

C) Added value services foreseen

Hamburg discussed different added value services that could be implemented in the Use-Case. First, to utilise the return trip of the barge for other purposes once all the containers have been brought on land and into the micro hub. For example, offer laundry and delivery services for the hotels and businesses in the area or collect waste and bring them in recycling centre.

Second consideration is about adding one or several additional stops with micro consolidation centre or parcel lockers as pick-up and return point along the route of the barge (that can be extended as well) to enhance the area for cargo bike deliveries.

All of these considerations were made in co-creation with the local partners, and notably through a survey sent which resulted in the definition of the most interesting services to be added:

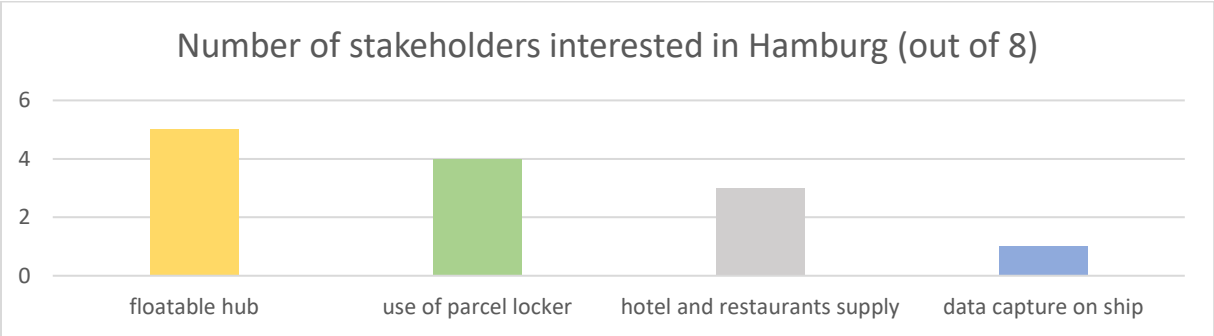


Figure 33: Result of the survey sent to the local stakeholders in the LL (Source: IT, 2024)

The original idea of using the barge as a floatable micro-hub was dismissed because the containers will not be collected from the barge by DHL due to safety reasons, handover between the skipper and DHL teams (also with regards to responsibility) is therefore planned to take place at the quay wall, once the bike container is off the barge. Therefore, the cargo cannot be left unwatched (risk of theft) and has to be stored somewhere while DHL' staff is delivering the first parcels. In addition, if it works out, the barge would be used for the Innowatr project as well – which means it becomes it needs to be free for other purposes once all the containers have been brought on land and into the micro hub.

Finally, optimized delivery routes through real-time transportation monitoring of the barge (and data capture), forecasting and dynamic routing are some digital solutions that will bring added-value services to this use case. There are still under development by the technical partners of the project and may be up to change.

D) Use case locations

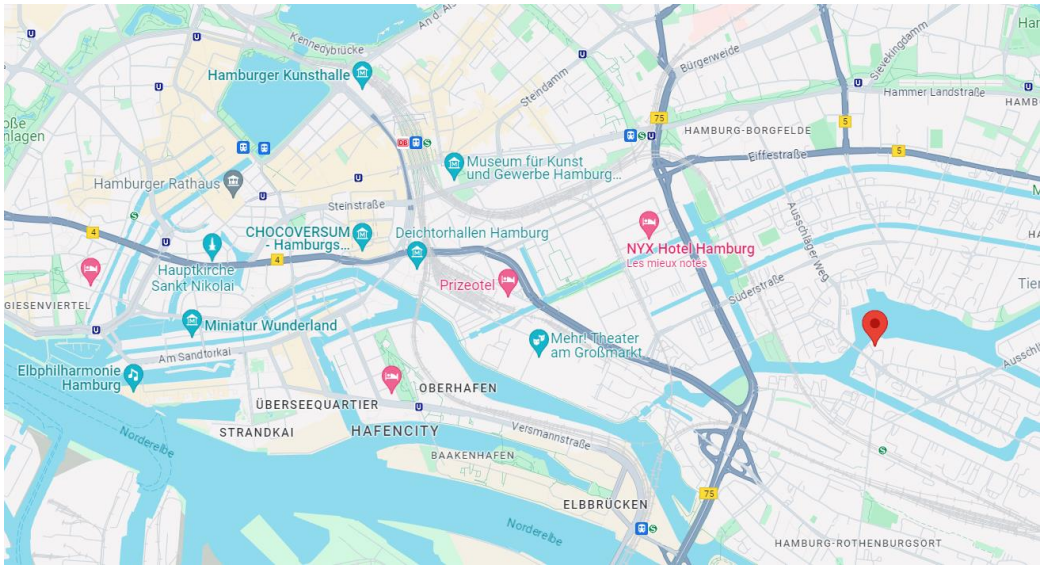


Figure 34: Loading point (Source: Google maps, 2024)

The original idea of using Neuer Wall 77 as unloading site was dismissed for the following operational reasons:

- due to required reconstruction measures at the ramp/stairs (not enough space for pedestrians to walk if the ramp is installed for cargo bikes),

- the proximity to the exit of the public transport station etc.

The new envisioned area is the sluice, there might be two options:

- Option 1: West chamber of the sluice. This might be the ideal solution as it belongs to LSBG. Unfortunately, construction work may take place in 2025. In this case, unloading would not be possible. Important questions to OHB: what is the draught when loaded?
- Option 2: A little further away from the lock (Am Alsterfleet). In this case the barge would pass the Eastern chamber of the sluice (which will remain open).

By October 2024 we will know if construction works are feasible (following the decision on the closing of the sluice) and HAM have to give an answer on whether or not the space will be used by November 2024. The challenge for this location is to find a place to put the DPDHL micro-hub.

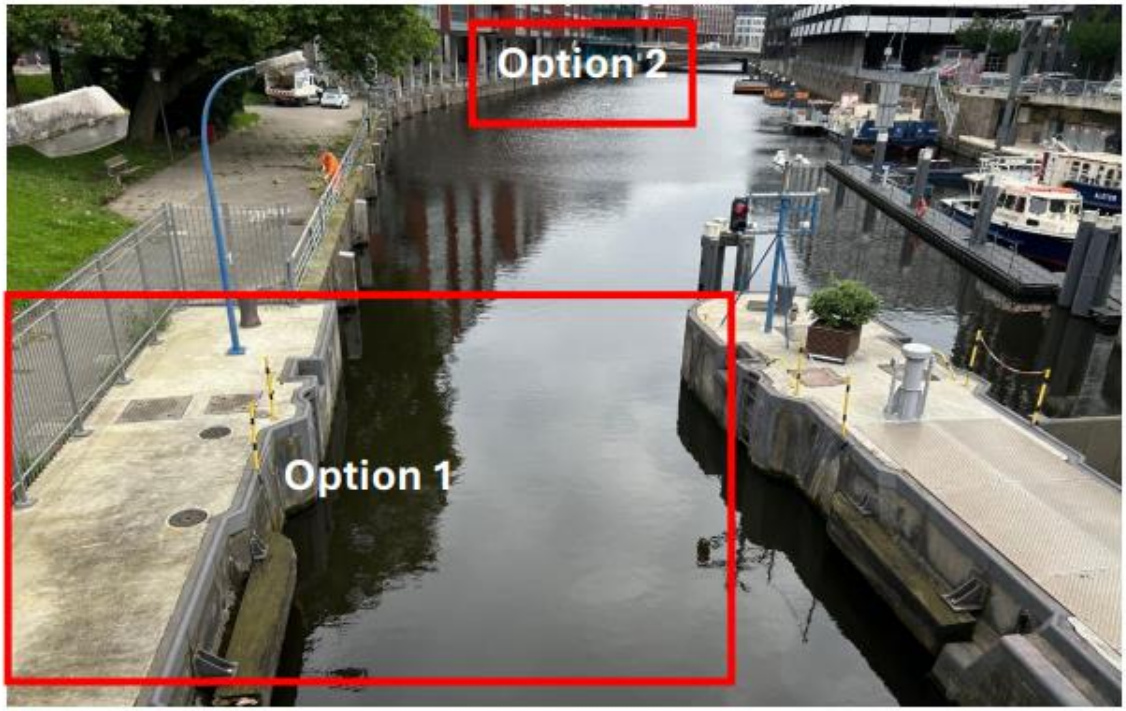


Figure 35: Unloading point (Source: HAM, 2024)

But the relevant identified locations of the use case in the Living Lab Hamburg include not only the loading and unloading locations, but also the two sluices which we need to surpass:

1. Tiefstackschleuse
2. Schaartorschleuse

Sluices in Hamburg are necessary due to the tide, as they regulate the different water levels in the canals.

E) Utilisation of Data and ICT Tools

On the vessel, OHB uses its own tracking system and has a cooperation with NGS for extra tracking (**GPS, temperature, humidity**) to send to the platform together with DHL device. Due to local German regulations, no trackers can be put on the bikes directly. However, further ICT tools might be placed on the containers transported (TBC).

F) Key challenges and lessons learned

As the use case progressed, the Living Lab Hamburg encountered various challenges that had to be solved. From the different conditions at the essential locations, to the requirements of the ship. The main difficulty was to find the perfect locations for the loading and the unloading of the barge, which requires a great number of conditions to be respected. Additionally, the technical characteristics of the barge needed to be adapted to the sailing conditions in Hamburg. Numerous technical challenges were identified and solved thanks to the flexibility and adaptation skills of the stakeholders. What was kept as good knowledge for future projects is that keeping the stakeholders informed and involving them early enough in the progress of the use case, showed as the most helpful lever. Many topics were advanced, and solutions found, primarily due to the high level of commitment of the stakeholders to make the use case a success.

USE CASES ISTANBUL – DETAILS

A) Introduction

Three scenarios are being studied in Istanbul. Use Case 1 and Use Case 2 are related to the Micro-Consolidation center run by MIGROS (consortium partner), where existing logistics services are improved with smart technologies and solutions provided by DECARBOMILE.

The Use Case 3 includes an Urban-Consolidation Center in Istanbul which will be used jointly in cooperation with a local logistics company, ILETMEN.

B) Key challenges and Learning

During the process, certain issues were revisited among the Turkish partners of the consortium in the context of use case definition like the question “who will pay for which need in which scenario?” etc.

The innovative idea of a joint consolidation center and joint distribution of companies is not an uncommon move in the logistics industry. Thus, this agenda brought up questions in the meetings held with local logistics companies during the Stakeholder Engagement process when it tried to involve them in the project and use case.

Using a joint hub can be difficult especially when the stakeholders are competitors in the same logistic sector (e.g. they deliver the same goods to the customers). Therefore, in our use case of joint consolidation center, we did not choose a food retailer as a stakeholder. ILETMEN is a cargo delivery company.

The main challenge during the implementation process will be to try to meet the structural requirements with the project budget due to changing exchange/cost development in the country.

In line with the workshop and templates, which were provided by the consortium, visually memorable steps were easily determined and grouped while studying with Istanbul partners.

During the field trip carried out with local partners, data and visuals about the physical space were collected, and its suitability was evaluated with the consortium partners.

Maps and documents regarding the prepared infrastructure (prepared through data acquisition with consortium partners) shed light on the use case process.

C) Use case definition

USE-CASE 1&2

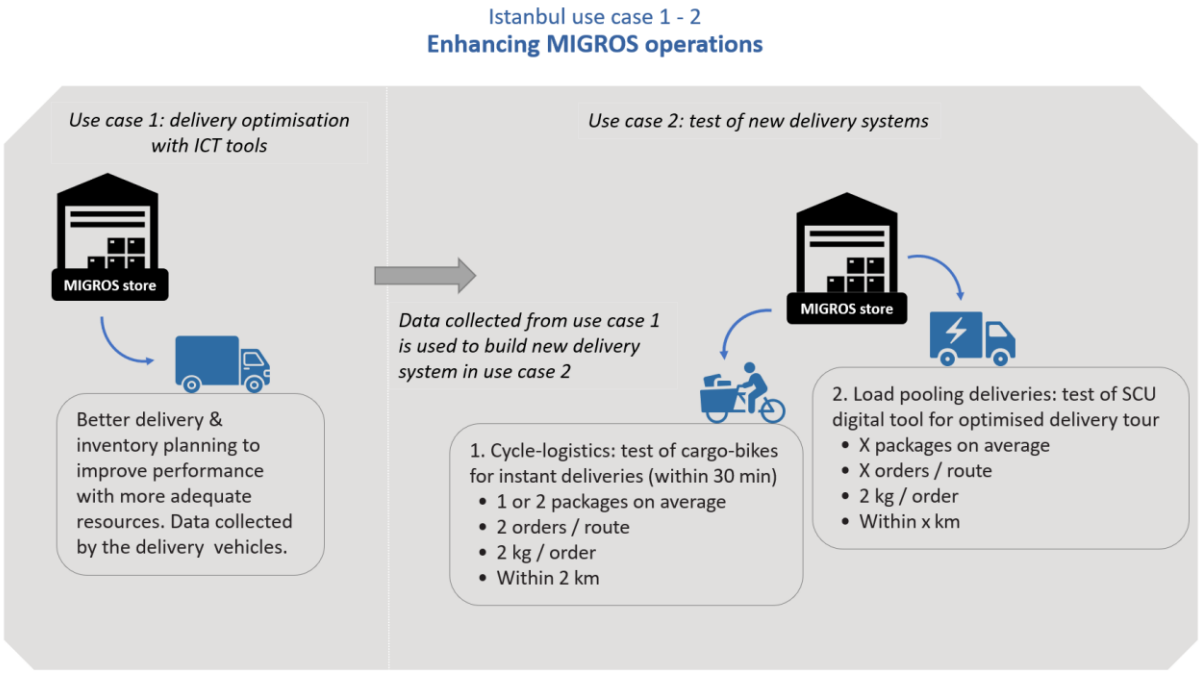


Figure 36: Visual of the use case 1&2 (Source: Interface 2024)

A) Baseline

Currently, in Bahariye Mjet store, Migros is carrying out a HEMEN operation which means a fast instant delivery within 30 minutes, usually 1-2 items with average package weight of 2 kg. The delivery is handheld by motorcycles within the area of distribution of 2 km radius as soon as the order arrives. This store is located in Kadıkoy region in Istanbul. The store warehouse is used for HEMEN operations. In the reference situation, 11 diesel motor scooters operate from the hub, with 20 to 21 tours per day, each of them being on average 1.25 km long (serving 1 to 2 clients maximum).

B) Use Case Description

In this Use Case, there will be two improvements:

1- In an existing warehouse, an extra area is partitioned off in which a micro hub is to be installed. The delivery will be carried out by means of e-cargo bikes instead of motorcycles to reduce carbon emissions in the last mile delivery operation.

2- By using a forecasting algorithm as an ICT tool, the future orders coming from customers will be forecasted more precisely. In this manner, the cost for inventory will be optimised with better inventory planning.

C) Added value services foreseen

The added-value services to be potentially implemented in the use cases were discussed with the main stakeholder involved, MIGROS, and a survey was filled-in to identify the most relevant ones:

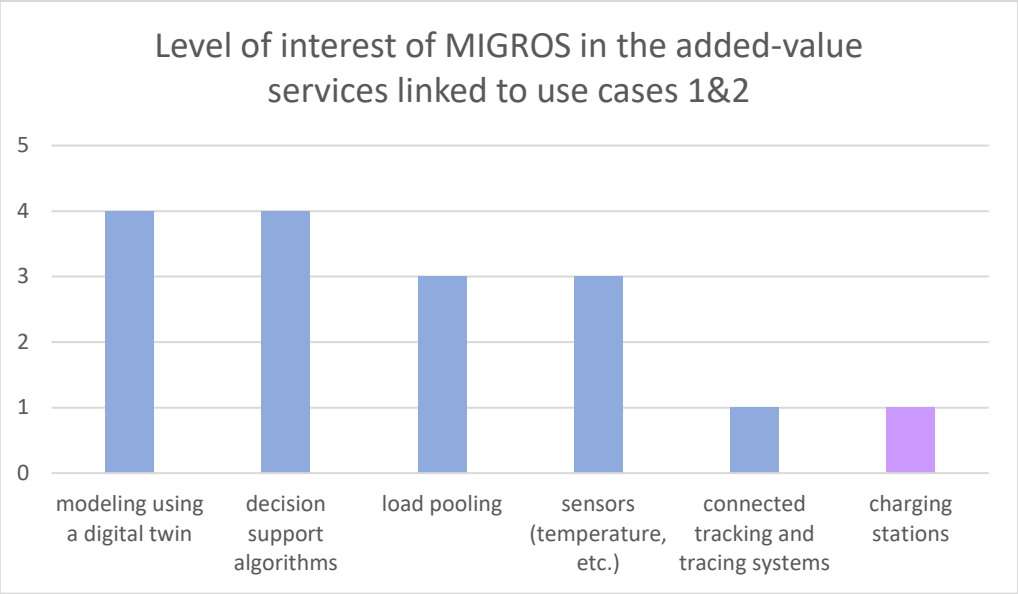


Figure 37: Result of the survey sent to the local stakeholders in the LL (Source: IT, 2024)

We can see that the most interesting services are modelling using a digital twin and decision support algorithms, which are digital solutions currently under development by the technical partners of the project, in order to add them to the use case 2.

"*If demand forecast result is acceptable for our business according to know how etc. we will implement these results to our source planning (number of vehicle and shifts of carrier).*"

In addition, a load pooling tool will be tested with time-slot deliveries operated with thermic LCVs, either from this same hub, or from a different one (TBD).

Due to the instant delivery model which requires quick reactivity on the deliveries, parcel lockers implementation was not discussed.

D) Relevant Locations

Bahariye MJet Migros Store which is in Kadikoy region in Istanbul was selected as a Micro Hub location for Use Case 1&2. This store is located between narrow streets in a busy and crowded place which is suitable for the e-cargo bike operation.

E) Utilisation of Data and ICT Tools

The 1st ICT tool is about forecasting customer orders more precisely by means of smart algorithms according to the historical data. In this manner, the inventory level of goods, the source and shift planning will be improved and therefore, the cost for inventory and staff will be optimised.

The 2nd ICT tool will be a Load Pooling algorithm aiming to get more orders during the same delivery route. It is expected to increase the efficiency of vehicle capacity. Also, it is expected to satisfy more customers and increase the sales.

USE-CASE 3

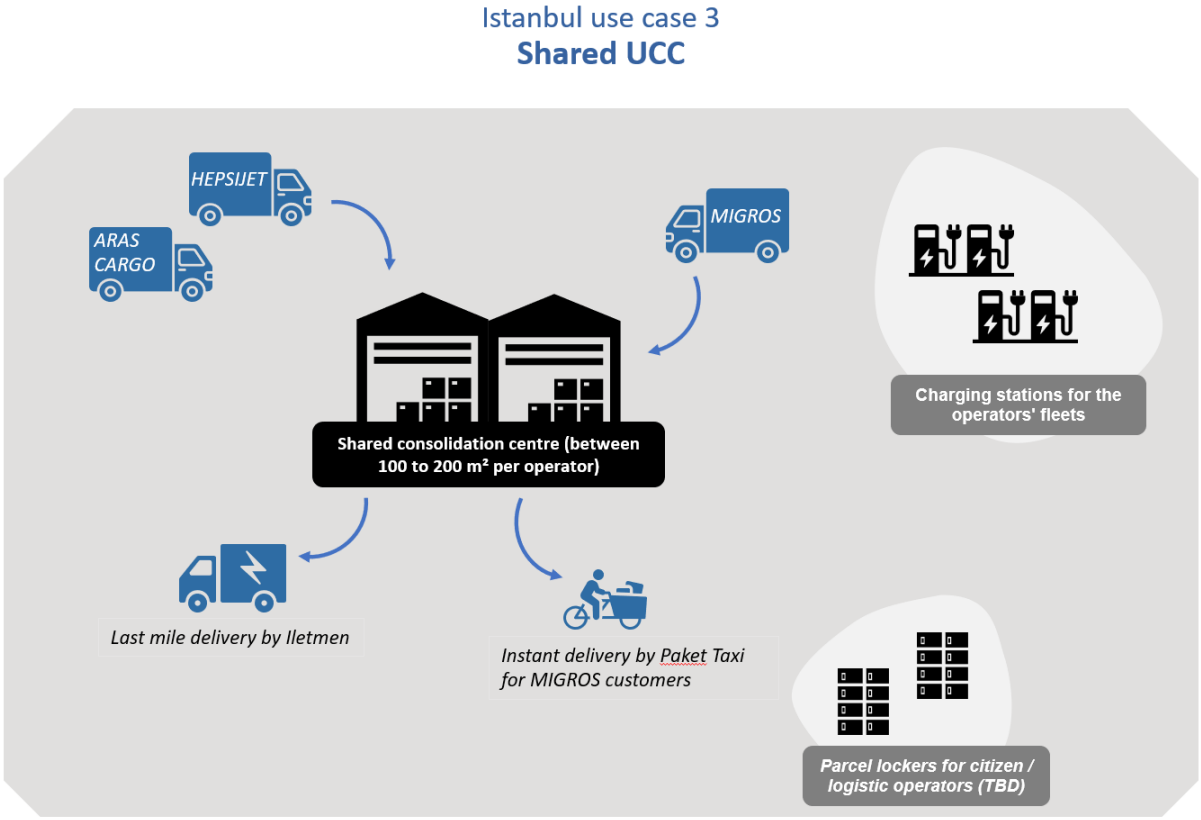


Figure 38: Visual of the use case 3 (Source: IT, 2024)

A) Baseline

For the UCC, a region where last mile logistics and deliveries are carried out intensively by motor vehicles was selected. The area chosen for UCC is located on a busy main financial street. The back of UCC is a dense residential area.

B) Use Case Description

It is planned that two different logistics companies, a consortium partner and a local partner, will make deliveries using a joint consolidation center. A station that will support the electric vehicle charging infrastructure and one of the modern delivery cabinets will be used in the distribution operations.

C) Added Value Services foreseen

MIGROS and Iletmen, are the two stakeholders that will share the UCC in this use case and they both responded to the survey. Below are presented the three side services linked to this use case which were evaluated:

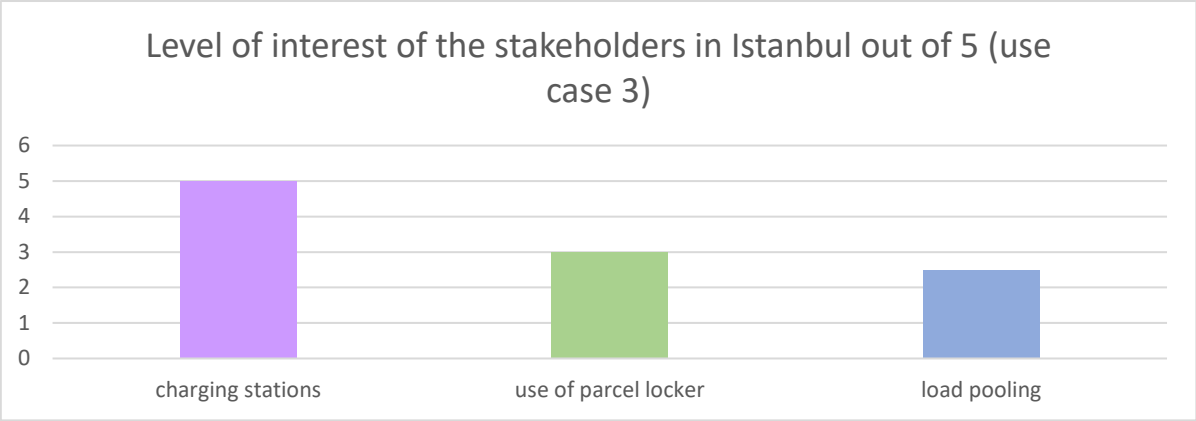


Figure 39: Result of the survey sent to the local stakeholders in the LL (Source: IT, 2024)

Iletmen's level of interest for the side services foreseen is high (worst ranking was 4 out of 5 for the level of interest concerning load pooling). They will help in the realisation of the pilot by **providing cargo-bikes, software and distribution.**

They are less interested in the load pooling digital tool as they are already planning on **using tools for vehicle routing,** real time delivery tracking, proof of delivery, reverse logistics operations and location-based customer segmentation analyses.

On **MIGROS** side, it is different because they are evaluating the **parcel lockers as unusable** (they are operating instant delivery, which is not in coherence with the lockers concept). Also, they are ranking their level of interest in **load pooling** as 1 out of 5 for the same reason as parcel locker: their instant deliveries are only concerning one client at the time (or max two) and load pooling would not work for this type of operation.

Still, the charging stations and parcel lockers will be implemented, since they are bringing additional value for the users of the shared hub and for the end-consumers.

The **parcel lockers** provided by IMM will be located near the bus stop at the consolidation centre (details TBD). The possibility of having **solar-powered parcel lockers** was discussed. Kargo Park (parcel locker provider) can also design cabinet columns based on the needs expressed by the operators and can include an option for parcel lockers to recharge the battery of the cargo bikes. In addition, IMM would provide a **charging infrastructure** (details TBD) for e-delivery vehicles which will be shared by all actors.

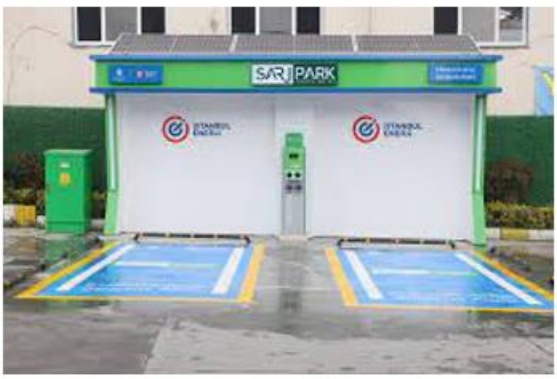


Figure 40: Possible charging station structures to be installed in the area (Source: IMM, 2024)

At a later stage, we can envision to have the operators sharing the hub also sharing fleet and mutualising deliveries, even though it was not presented in the survey.

D) Relevant Location

It is an area with shared ownership between the municipality and one of its subsidiary companies. The part owned by the municipality (slightly larger than 500 square meters) will be used for the project.

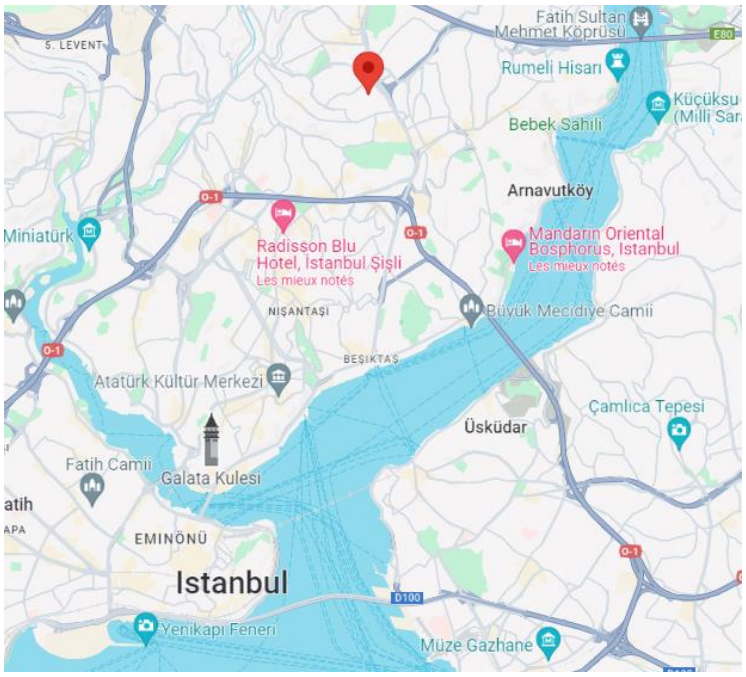


Figure 41: Map of the location (Source: Google maps, 2024)

E) Utilisation of Data and ICT Tools

For the UCC in Istanbul, the tools the logistics operator needed were discussed in the relevant meetings with the local stakeholders. The Tracker for container tool was appreciated, but the solutions developed for Cargobikes and Scooters were the focus. Real-time transport monitoring and fleet management tools are specified for local partners who distribute to many different companies (capability and power issues etc).

USE CASES NANTES – DETAILS

A) Introduction

In Living Lab Nantes three uses cases family were initially defined within Tasks 2.2 to achieve consolidation flows:

- UC1: Shared hub in pedestrian zone (Parc des chantiers)
- UC2: MCC on public space
- UC3: Container on public space

The first Use Case (UC1) aimed to calm down traffic in a pedestrian and touristic area by using a cargo bike for last-mile deliveries instead of trucks. All that would be possible thanks to a MCC situated on the border of the area.

As we moved forward in the use-case definition, it occurred that UC1 “shared hub in pedestrian zone” was not relevant because of two main issues: first, we feared use conflicts between trucks delivering the hub and pedestrians passing by, especially children going to the school located close to the hub. In addition, a field observation showed that delivery flows were not significant enough to justify another transshipment before final delivery. Consequently, UC1 family switched to “Leveraging existing logistics hubs and processes”.

The Use Case 2, named Hybrid Logistic Space has a “sub use case” that take an existing hub with spaces for parking trucks and with space to transfer cargo from will assure the last parcel of the delivery. The site can be parking spaces that will be put at disposal by the municipality or in a partnership with the private sector to allow the deliveries, the construction and installation of the hub.

Finally, the Use Case 3, the Temporary Logistic Hub, also combine the installation of a micro hub in a public space but this time using shipping containers that will be recycled. Those containers will have solar panels that can allow a power autonomy to charge bikes or cargo bikes and onsite the clients will also be able to rent those vehicles and operators will also be able to trade the cargo from trucks to other vehicles.

At present,3 use-cases are being worked on involving 10 stakeholders

- UC1: Leveraging existing logistics hubs and processes (Hepner, Toutenvelo, Db Shenker, TRI, Les Coursiers Nantais)
- UC2: MCC on public space - Hybrid logistic space for pro and citizen on public space (CCI)
- UC3: TRI hub for cycle-logistics last-mile deliveries on public space (TRI, REV)

B) Key challenges and Learning

In the Living Lab Nantes, there has been quite a variety of challenges and learnings during the process definitions. The main challenges are related to the reluctance of stakeholders to collaborate due to the lack of demand by clients.

A synthesis of the main challenges identified in Nantes LL is available below. During the process and to face the challenges, we decided to talk with the stakeholders and logistic operators to understand their needs and to meet them in our use cases. We tried to combine their ideas with the projects and policies from the municipality and from that get a result that would be optimal for all parts and to consolidate the definition of use cases.

All the details on the methodology of the definition of the use cases can be found on the Chapter 3.2 and on Chapter 5 – 5.4.

USE-CASE 1 – LEVERAGING EXISTING LOGISTICS HUBS AND PROCESSES

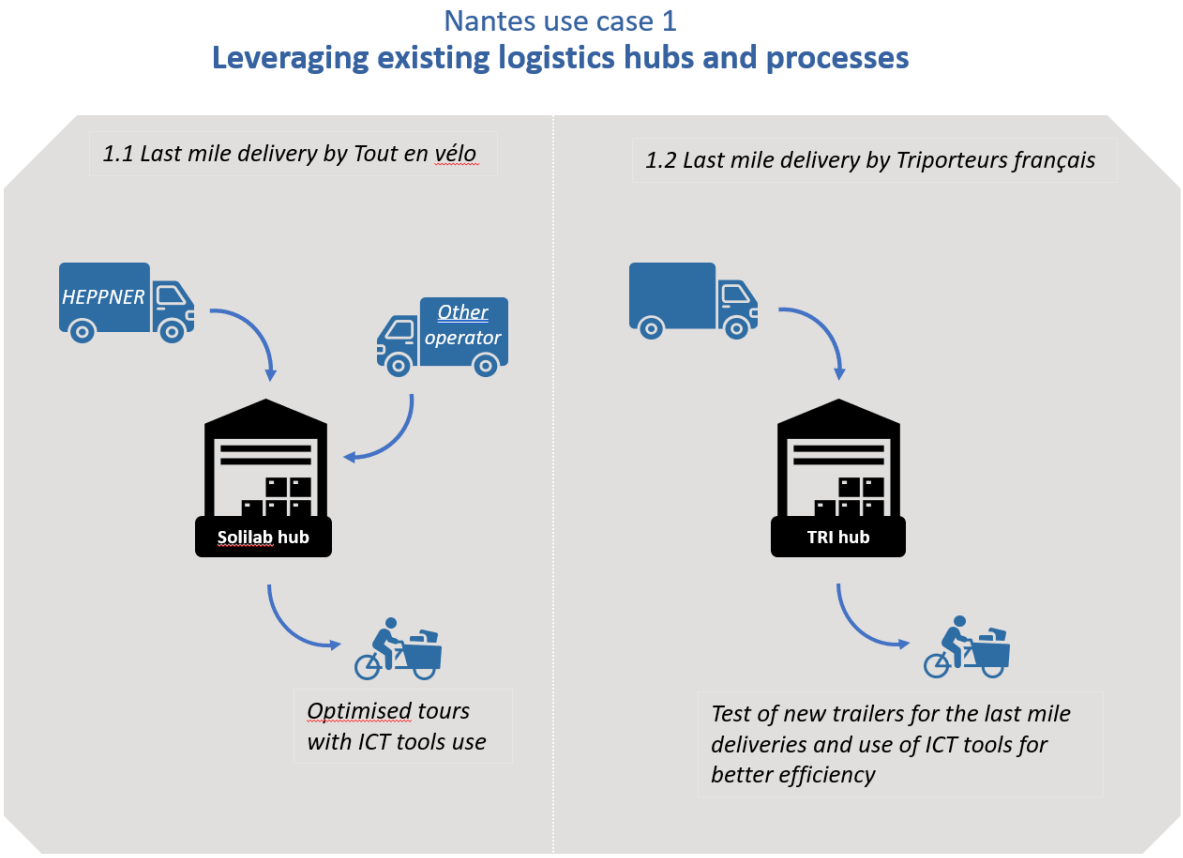


Figure 42: Visual of use case 1 (Source: IT, 2024)

A) Baseline

Currently, several cyclelogistic operators receive goods from trucks in their hubs situated near Nantes city center. Logistic operators rank goods to design optimized tours to be made with cargo-bikes. This organisation of last mile deliveries is intuitively less polluting and disturbing (sound, congestion...) than trucks delivery. However, this assertion needs to be verified and maybe these advantages could be amplified. Furthermore, a larger range of goods could be delivered by cargo bike thanks to new equipment – such as fresh food which needs cold storage.

B) Use Case Description

On this use case we have two hubs that are already operating with the stakeholders. They are placed in a perimeter not far from the city center that allow the trucks to get in the city and to load the bikes to ensure the last mile delivery. Since it's not far from the destination, all can be delivery by cargo bikes.

Two ways to amplify delivery with cargo bikes will be tested:

- 1.1: Thanks to ICT tools, tours will be monitored and optimized in Toutenvelo hubs.
- 1.2: New FLEX trailers will be tested in TRI hubs, in addition to the use of ICT tools to monitor and optimized deliveries.

C) Added Value Service foreseen

The digital solutions to be tested by Tout en vélo are still under discussion and will bring added value to their operations if tested.

D) Relevant Locations

Use-cases will take place in existing cyclo-logistic hub, in Nantes:

- Solilab for Tout en Vélo
- Rue des Olivettes for TRI

Figure 43: Map of the hub localisation for the use case 1 Source: IT, 2024)

E) Utilisation of Data and ICT Tools

The ICT tools that will be deployed include trackers and route optimization. In this use case, it is critical to track the location and dimensions of the items / packages. That will allow for real-time tracking of the deliveries, including if they are on time to arrive at the hub and when they depart for the client.

The route optimization algorithm is also important for ensuring the correct delivery because it considers limitation points, calculates an optimal path for each vehicle, and informs how many vehicles are required to transport the items.

USE CASE 2 – HYBRID LOGISTIC SPACE FOR PROS AND CITIZENS ON PUBLIC SPACE

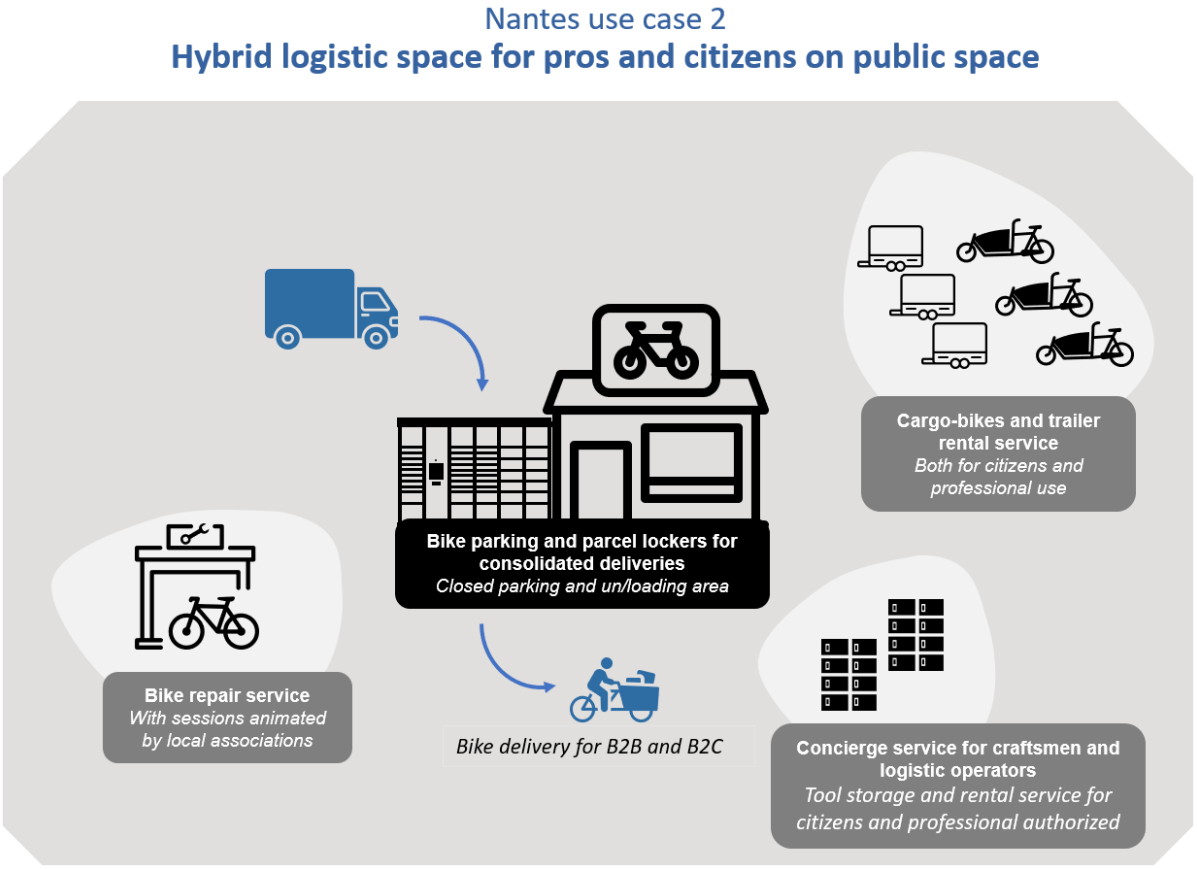


Figure 44: Visual of the use case 2 (Source: IT, 2024)

A) Baseline

This Use case has a baseline on making easier the modal switch from van to cargo bikes. The idea consists of building a hub on a parking lot close to the centre and making possible for the trucks to park and trade the products to cargo bike. For that matter, on this hub it would be possible to park the car, put the materials on cargo bikes rented over there and then go to the work. It's thought specially for craftsmen but not only. The hub would also respond to other needs as the installation of parcel lockers that could store materials or even packages that could be delivered there and then picked up by the customer. Finally, a reparation spot could be very useful to repair the bikes rented.

B) Use Case Description

This use case is intended for the Chantenay district and is being held by Nantes, designers, and the Chamber of Commerce & Industry (CCI). It has its own budget and is at the early stages of development, particularly in terms of materials, construction, and legal availability.

The goal is to use CCI's parking lot to create three parking places for professionals and clients.

1) Location and parking for cyclists

The uses are two-fold:

- Rent of cargo bikes and bikes for multiple uses (especially for residents)
- Secure parking for bicycles and transport bikes.

2) Storage Space

Parcel lockers may store items during the day while professionals work, or a cargo bike can deliver products for later pickup by a car or bike.

3) Area of service/repair

The final space in this parking lot would be used as a bike repair service.

C) Added Value Service foreseen

IMT will investigate tools to optimise parking space use. Using it can brig value to the use case by providing more space to include other potential services.

During the implementation of the use-case and the project timeframe, the area will be closed to the general public. This will help to regulate entry and protect the valuable materials during the testing phase. There is the possibility to open the space to the public later on, as an added-value service.

Consolidating the last-mile deliveries by cargo-bikes through this hub could be as well an interesting added-value service.

D) Relevant Locations

The location needs to be close enough to the city centre to make bike journeys realistic but also easily reachable by trucks from the periphery, especially considering public works around the city centre.

The parking slot of the ex-Chamber of Commerce and Industry (CCI) head office seems perfect for that use.

Figure 45: Aerial view of the Hybrid Logistics Hub's proposed location (source: Google Maps, 2024)

E) Utilisation of Data and ICT Tools

At the moment, we don't plan on using IcT tools for this use case. If needed, we can try to implement it for the evaluation.

USE CASE 3 – MICRO-HUB ON PUBLIC SPACE

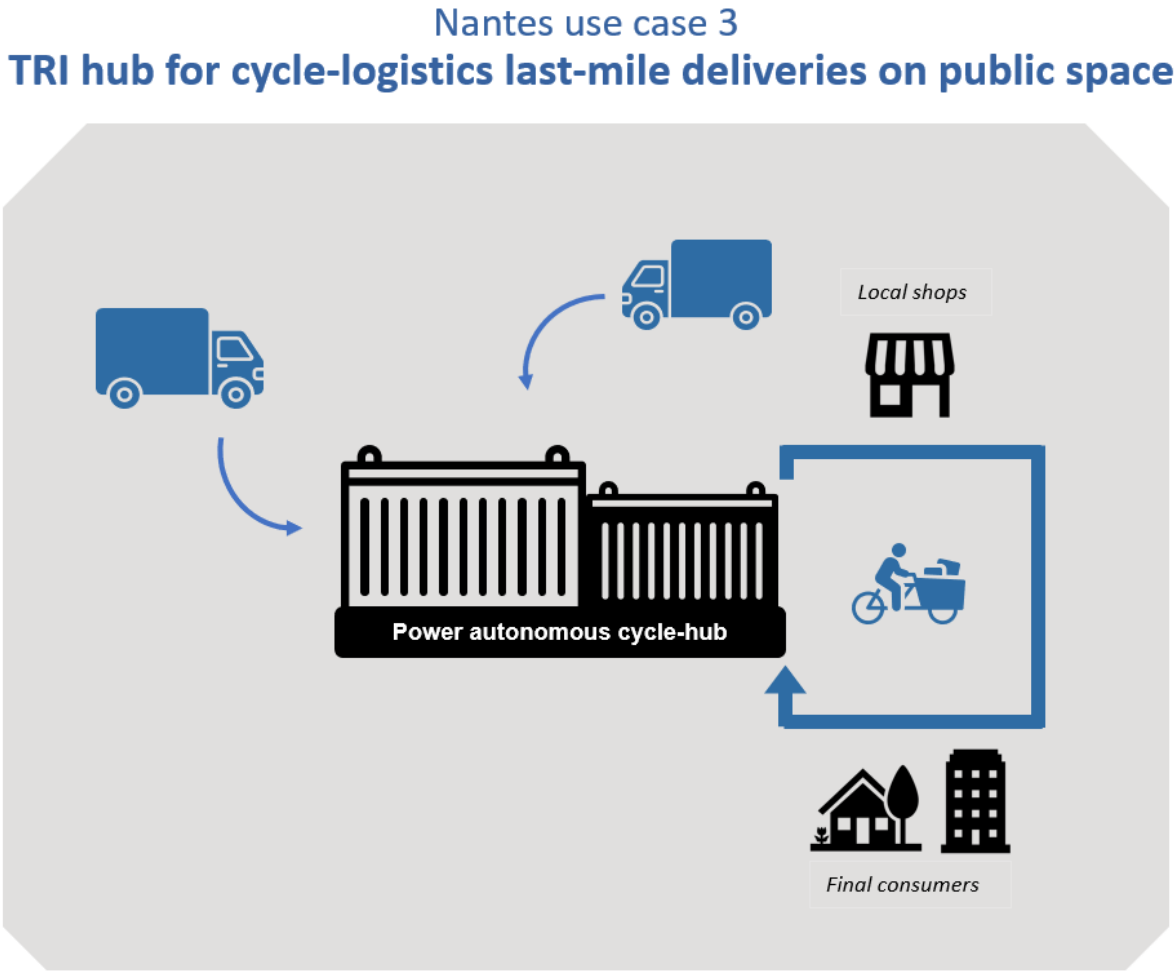


Figure 46: Visual of the use case 3 (Source: IT, 2024)

A) Baseline

The Use case 3 refers to the implementation of a micro hub. To reduce the costs of renting or purchasing warehouses in the city centre, the idea is to recycle shipping containers that can be used as hubs to decarbonize the deliveries. The installation of the containers is not yet set but will be in a perimeter close to the centre. This only hub will be operated by TRI and the operation of the last mile will be shared with other stakeholders. As UC2 will provide lockers of different sizes that mostly suits for parcels, the containers developed in UC3 will be dedicated to larger goods, such as pallets.

B) Use Case Description

The Use Case 3 is developed in collaboration with a French company with the goal of modifying containers to become energy self-sufficient (solar panels) and equipped for urban logistics. The goal is to instal a micro hub with containers of 40ft and 20ft, positioned side by side in a parking lot or another location near the city centre.

The space would be used mostly to charge cargo bikes and enable for the decarbonization of last-mile deliveries, rather than for storage. It might also provide electric charging stations for the vehicles used for delivery.

C) Added Value Service foreseen

In the long term, we can imagine that more containers will be placed on the public space and that the space will be shared by different operator consolidating flows.

Some parcel lockers accessible for end consumers can also be a good service to add.

D) Relevant Location

The location for this use case follows the same conditions mentioned on the UC2. The spot needs to be close to the centre in order to make easier to do multiple bike rides between the hub and the centre during the day. It's also important to consider the ease to access the place for trucks coming from the periphery. A few sites on the city fill those needs and are being considered to host the hub.

Figure 47: CCI parking lot (Source Google maps, 2024)

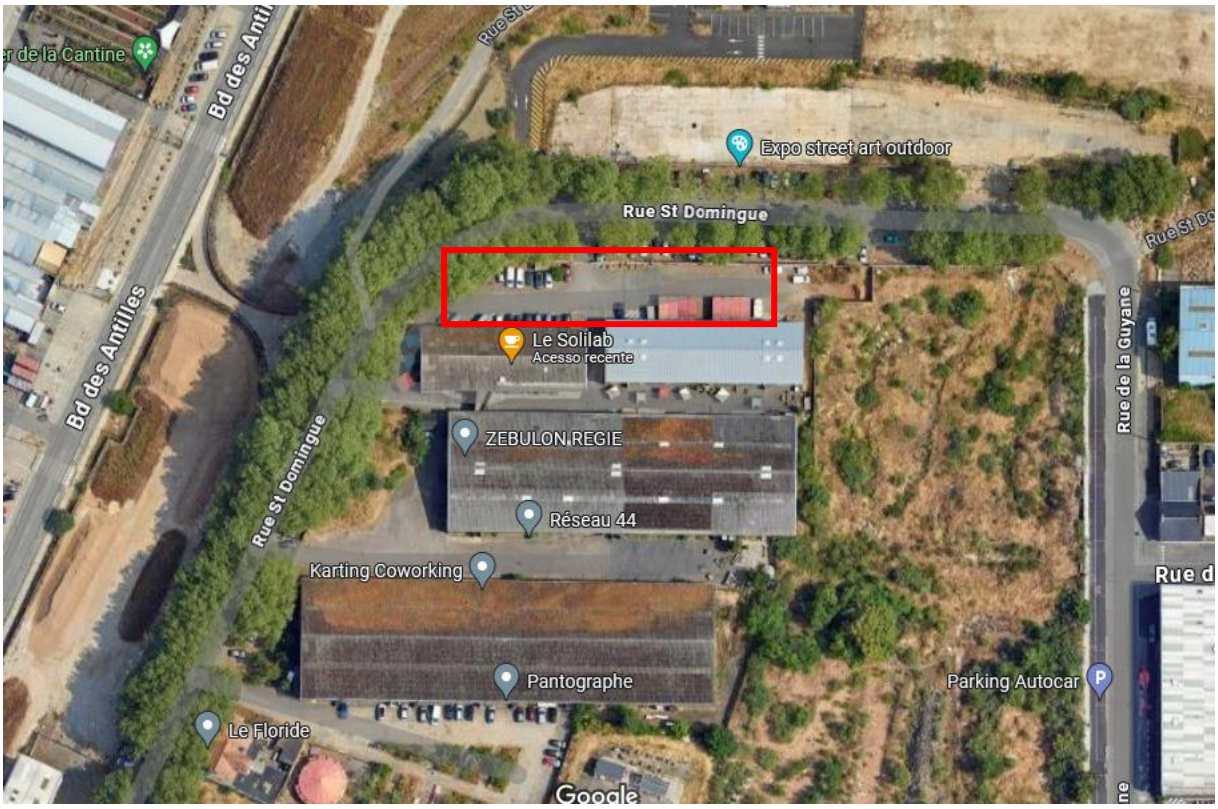


Figure 48: Solilab parking lot (Source Google maps, 2024)

E) Utilisation of Data and ICT Tools

At the moment, we don't plan on using IcT tools for this use case. If needed, we can try to implement it for evaluation purposes.

USE CASE LOGROÑO – DETAILS

A) Introduction

In Living Lab Logroño, four uses cases have been defined within Task 2.2 to achieve consolidation flows:

- logistic consolidation, parking of cargo bikes and good's storage addressed to local shops, self-employed and logistics companies
- consolidation of goods, fresh and non-fresh products
- lockers network in commercial areas of the city
- reverse logistics (circularity)

The use case definition started with the idea to demonstrate the sustainable urban delivery for the following different types of products in Logroño:

- parcels from logistics operators
- fresh and non-fresh products from local stores
- delivery service for dependant people
- recycling, mainly from restaurants (circularity of delivery - reverse logistics)
- network of parcel lockers

Additionally, another use case related to community service, focused on last mile delivery for dependant people and nursing homes for elderly people, was seen as possible, nevertheless it has

been currently discarded because it entails requirements for the delivery not possible to meet due to the assistance nature of this delivery, not purely logistics like home delivery of meals to elderly people, technical handling and delivery of medicines.

The use case definition process has involved local stakeholders through workshops and bilateral meetings. Among the stakeholders of the Living Lab Logroño, the key ones have been:

- a logistics operator
- a pharmacy distributor
- local trade associations
- local market association
- a recycling company

B) Key challenges and Learning

In the Living Lab Logroño, there has been quite a variety of challenges and learnings during the process definitions. The main challenges were related notably to stakeholders' engagement. As per the other Living Lab, it was difficult to engage the local actors into the definition of the use cases, mainly because of old habits that are difficult to shift (especially when it comes to change truck for bikes and add new ICT tools to the existing operations) and economic viability that needed to be proven for the stakeholders to engage. Finaly, a lack of resources on the territory, such as cycle-logistics providers or land space, which are key elements to the project's use cases.

C) Use case definition

USE-CASE 1 – CONSOLIDATED FLOWS AT A NANO-HUB

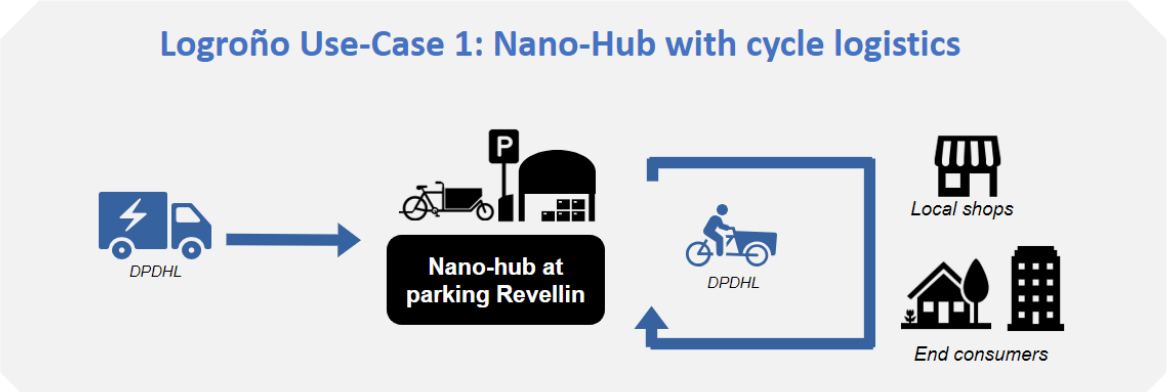


Figure 49: Visual of the use case 1 (Source: IT, 2024)

A) Baseline

Currently, last mile delivery is organised separately by each logistic operator / distributor using trucks and vehicles with fossil fuel engines and their own warehouses. According to a study "Studies and actions on the local Strategy for Sustainable Urban Mobility" elaborated by Movilidad&Transporte Asesores for the municipality in 2022, in an average week, some 131,000 parcels are delivered in the city of Logroño, which means that each person picks up 0.874 parcels per week. This represents a daily work mobility load of around 18,000 trips, a rate of 0.12 trips per person, which is only 3.9% of the overall mobility recorded for an average working day.

B) Use Case Description

The Use-Case aims for the consolidation of logistic operators using a Micro-Hub and implementing last mile delivery with cargo bikes. The nano micro hub will be composed of two micro hubs from INT merged (no parcel lockers) and completed by a container type for logistics purposes only (new equipment from INT from another project).

DHL will use the hub to store packages and implement last mile delivery by cargo bikes (TBC using the ones bought by the municipality). DHL will take care of the whole logistic process within the Use-Case.

C) Added Value Services foreseen

Some added-value services were identified at the beginning of the use case definition, and ranked by the local stakeholders depending on their level of interest for each:

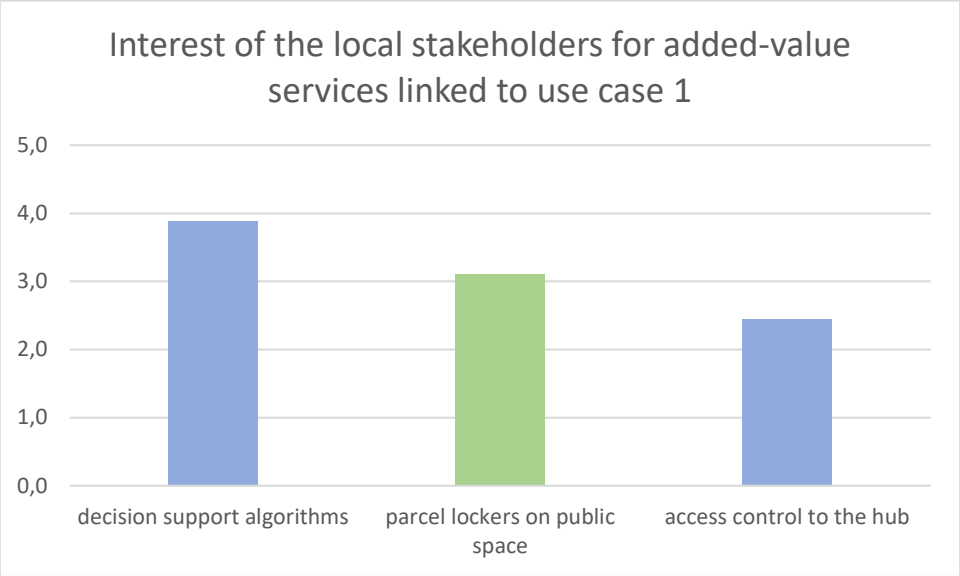


Figure 50: Result of the survey sent to the local stakeholders in the LL (Source: IT, 2024)

Based on these discussions, it is envisioned to implement the following services:

- Deported parcel storage (TBC based on the logistics lockers available)
- Renting of three public cargo bikes purchased by the municipality (with one owned by the mobility platform)
- Park and recharge cargo-bikes including private ones

The three cargo-bikes would be equipped with NGS trackers and made available to logistics operators or shops to book through the PVerde app, which will also provide access control to the hub.

To have decision support algorithm for the DHL operation is still under discussion.

Different scenarios can be envisioned for the long term of this use case, having **multiple logistic operators sharing the hub** (GLS, MRW, Dasher, …) either **with or without last mile consolidation**

D) Relevant Location

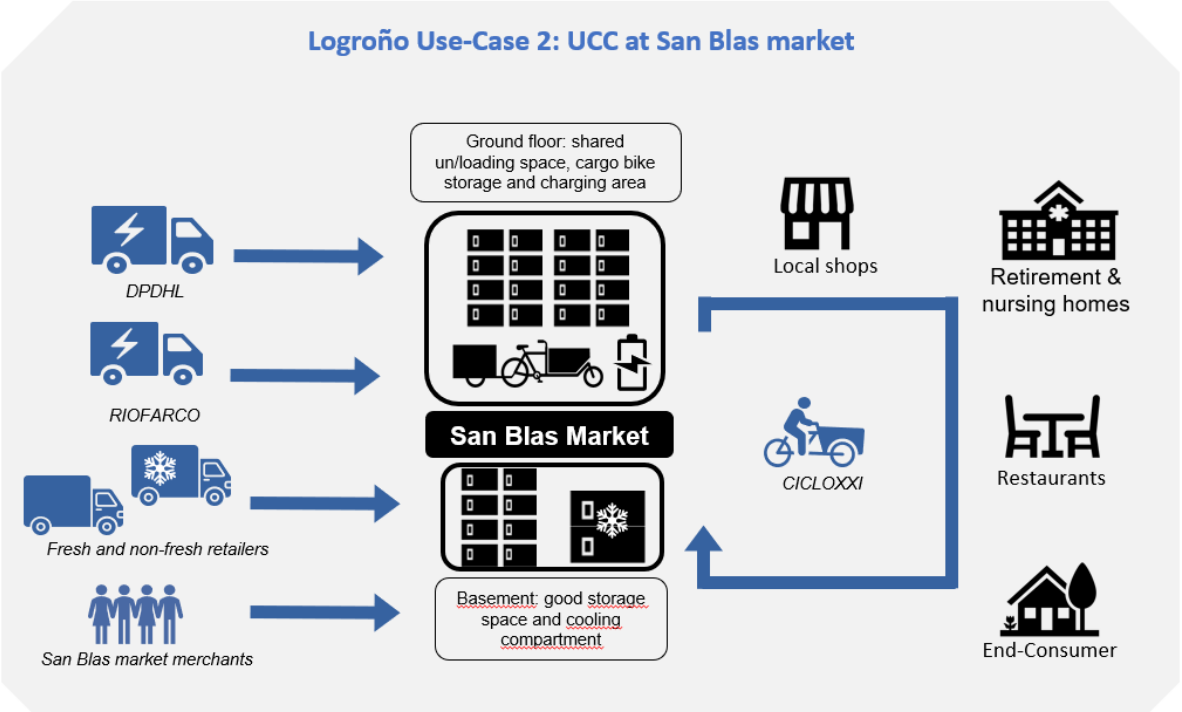
- A Micro-Hub will be installed near the old town close to Parking Revellin.
- A good number of locations were initially assessed. The chosen one was selected because their short distance to the old town and city centre, as well as the proximity to a parking area and availability of enough public space.

Figure 51: Location for the micro-hub (Source: Google maps, 2024)

E) Utilisation of Data and ICT Tools

- ParkingVerde app: access to the micro-hub and storage boxes
- registration of companies using cargo bikes, micro-hub and storage
- tracking sensors

Use-Case 2- Micro Consolidation Centre at San Blas market



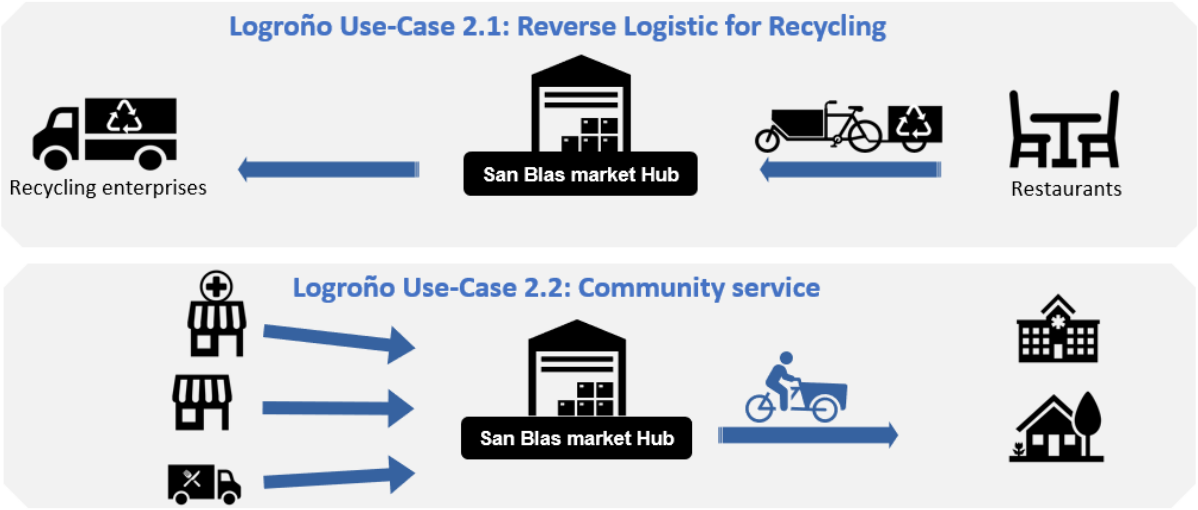


Figure 52: Visual of the use cases 2 (Source: IT, 2024)

A) Baseline

In Logroño there are no spaces within the urban area for the distribution of goods, only loading and unloading areas. Few local shops provide delivery service for customers and those that do it do the service themselves or in an informal way and with low level of digitalisation or any. Logistic operators are not used to take delivery items from local shops because number of deliveries are not high enough

B) Use Case Description

This use case will focus on consolidating flows from the local market San Blas, with the creation of a micro-hub in the basement. San Blas Market's hub will be open to consolidate flows from the market shops and from other external local shops and retailers interested, including fresh flows. The last mile delivery will be done with electric cargo bikes parked and stored in the market.

C) Added Value Services foreseen

Use Case 2.1 reverse logistics

Reverse logistics for local HORECA commerce' waste (oil and glass), with multimodal transport (cargo-bikes and light vehicles), will be integrated in the use case as an added-value service. On the way back from fresh good delivery, the logistic operator will pick up waste from restaurants to store them in a separate are of the San Blas basement. Waste collectors (including relevant services from the municipality such as the environmental department) will then come and pick up the waste at the hub to go back for treatment.

Use Case 2.2 community services

This additional service to the San Blas hub could aim to consolidate deliveries to elderly homes including, pharmacies, orthopaedics and or food delivery utilizing the newly created consolidation area and implementing last mile delivery with cargo bikes. The idea is that instead of several operators and shops delivering goods individually, goods are delivered, consolidated and stored at San Blas according to their destination, from where goods are delivered by one operator using cargo bikes.

Optionally, the flows of goods to the San Blas market hub will be already consolidated by one operator, collecting goods from different shops based on available space.

A survey was sent to local stakeholders to narrow-down other services that might be interesting to add and came out of it that decision support algorithms and having parcels lockers on public space.

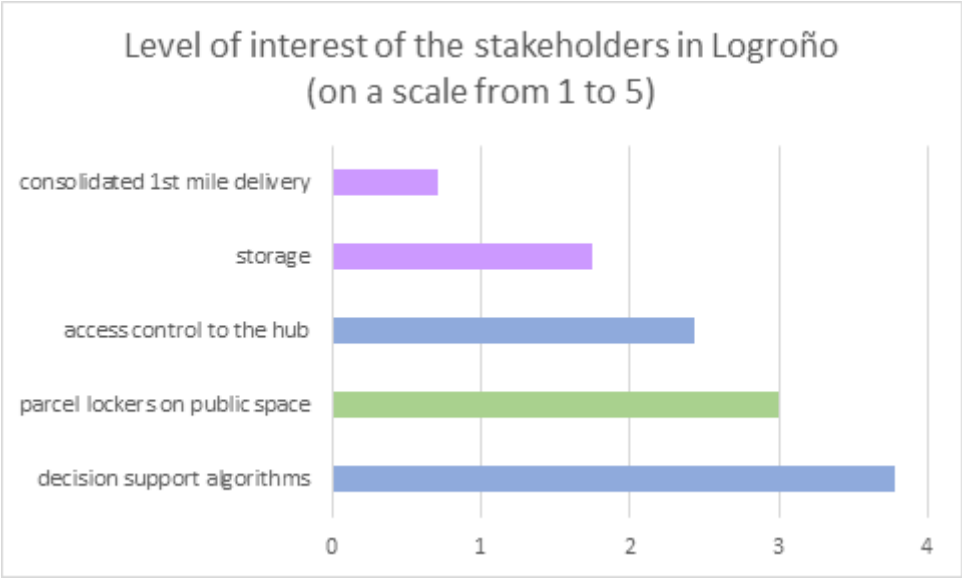


Figure 53: Result of the survey sent to the local stakeholders in the LL (Source: IT, 2024)

Thus, parcel lockers will be placed near San Blas market and is discussed the use of digital solution to optimise consolidation operations from the San Blas market.

D) Relevant Location

The premises have been assessed as ok, although not ideal mainly because the structure of a historical building cannot be modified.

Figure 54: Pictures of the garage (Source: LGN, 2024)

E) Utilisation of data and ICT tools

- Cargo bike user registration
- Track sensor in Cargo bikes
- Bluetooth tracker that provides information (temperature, humidity, door opening/closing acceleration) from the container carrying the cycle.

USE-CASE 3 – LOCKER NETWORK

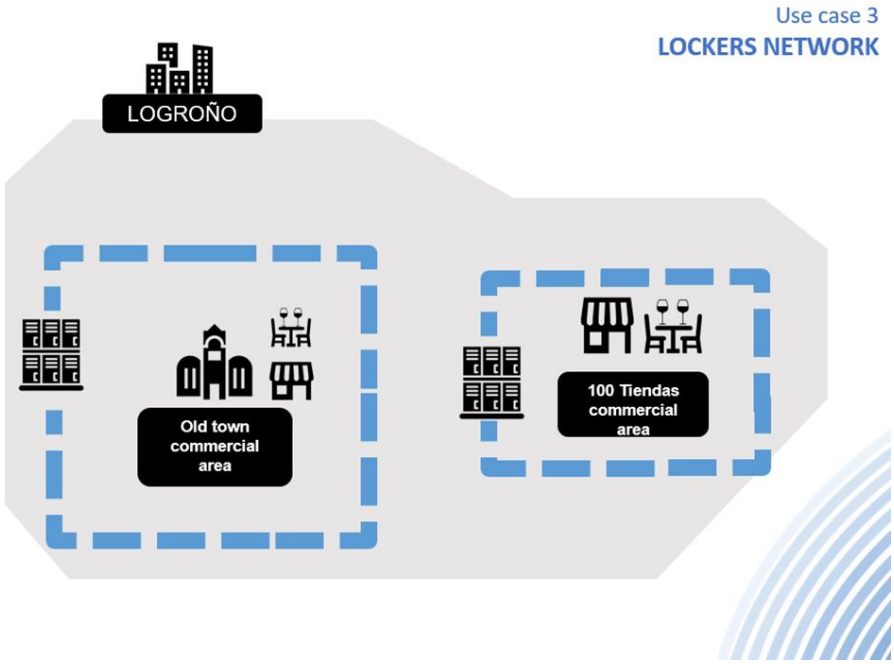


Figure 55: Visual of the use case 3 (Source: IT, 2024)

A) Baseline

Logroño, the capital city of La Rioja, Spain, is renowned for its vibrant cultural heritage, bustling shopping districts, and rich culinary experiences. Despite its charm, the city is facing a significant decline in the number of citizens and tourists engaging in local shopping activities within the city centre. One issue identified is the lack of convenient storage options, as there are no lockers available for visitors to store their purchased goods or luggage. This discourages extended visits, as people must carry their belongings, limiting their ability to explore the city and dine at local restaurants freely.

Local shops showed concerns to install parcel lockers, fearing they might serve e-commerce to the detriment of local businesses

B) Use Case Description

To encourage citizens to explore the city center and shop in the local shops, Logroño will install two parcel lockers near commercial areas of the city center and old town. The lockers will serve two main functions.

First, they will provide storage for citizens to store their bags or shopped goods, for up to 24h, while visiting the city or going to a restaurant. This will be a way to promote the combined entertainment of local shopping and restauration in a single trip to the center.

Second, they will allow local shops to sell goods outside opening hours by utilizing parcel lockers as self-service pick up stations. Shops can store the goods purchased online to be picked up by citizens.

The 100 tiendas merchants' association has shown interest in the lockers network.

C) Added Value Services foreseen

One potential added-value service that can be implemented once the lockers are well integrated in the customer's habits, can be to add a cargo-bike station next to the locker station to allow lockers' users to move their goods with a cargo-bike (either the local shops owners to bring goods to the lockers or end consumer bringing home their belongings.

D) Relevant Location

Lockers will be located in different commercial areas of the city decided in coordination with local commercial associations.

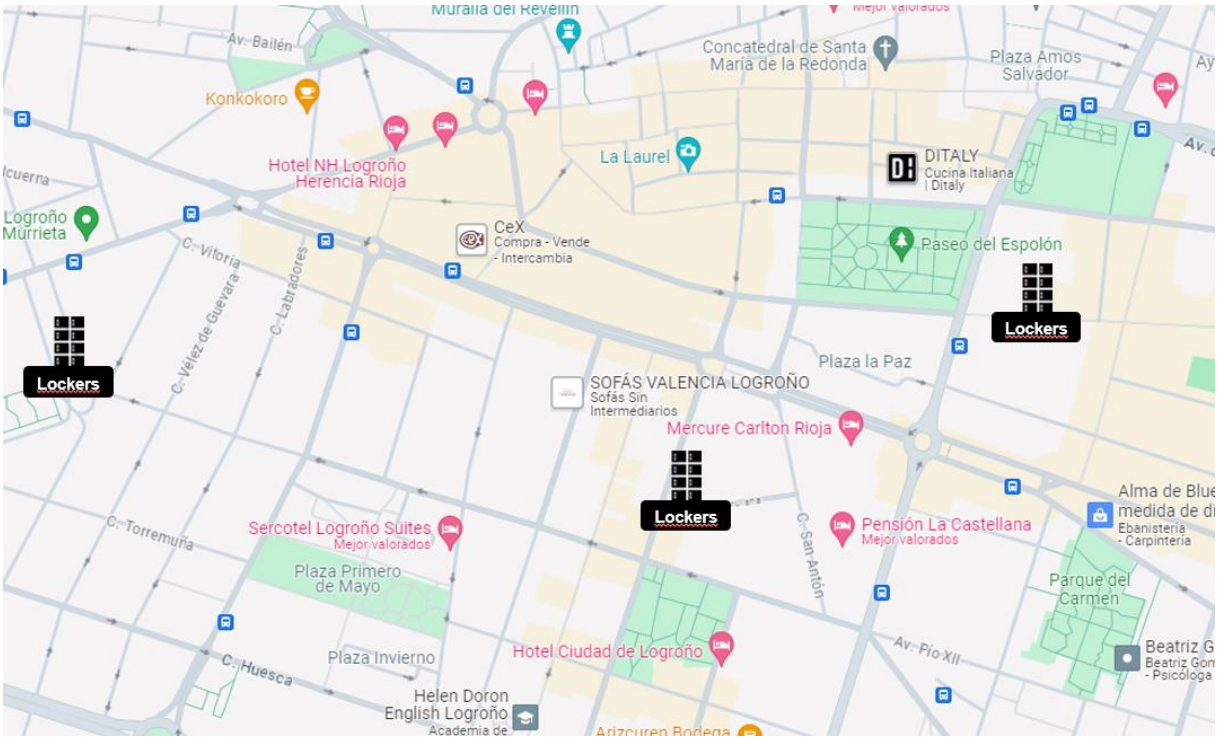


Figure 56: Map of the locker locations (Source: Google maps, LGN, 2024)

E) Utilisation of Data and ICT Tools

Use control system

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