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BOOSTLOG PROJECT

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The BOOSTLOG project consortium consists of:

Part. No	Participant organisation name (short name)	Country
1 (Coordinator)	Alliance for Logistics Innovation through Collaboration in Europe, ALICE AISBL (ALICE)	BE
2	STICHTING SMART FREIGHT CENTRE (SFC)	NL
3	FUNDACION ZARAGOZA LOGISTICS CENTER (ZLC)	ES
4	STICHTING TKI LOGISTIEK (TKI Dinalog)	NL
5	HACON INGENIEURGESELLSCHAFT MBH (HACON)	BE
6	INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS (ICCS)	GR
7	Vlaams Instituut voor de Logistiek VZW (VIL)	BE
8	FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V. (Fraunhofer)	GE
9	FIT Consulting SRL (FIT)	IT
10	FUNDACION DE LA COMUNIDAD VALENCIANA PARA LA INVESTIGACION, PROMOCION Y ESTUDIOS COMERCIALES DE VALENCIAPORT (VPF)	ES
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Contents

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Definitions of terms used in this deliverable

Term	Definition
Experts	Persons with extensive knowledge or ability in an area of study or work.
Results	The main deliverables, publications etc. out of the projects. For EU Horizon 2020 projects, they are available through CORDIS projects pages
Outcome	Products, services, solutions or knowledge for business or policy applications aiming at addressing Pain Points and other value-added results potentially impacting the market (by creating it or transform it), the Companies operations as well as polices and regulation. Results that could set direction in Companies and Governments are considered Outcomes too
Implementation Case	A concrete example in which causal links between public R&I funding and technology, organizational or process innovation in a specific logistics area can be established.
Logistics Cloud	A term used in the BOOSTLOG project to refer in a generic way to a freight transport and logistics domain providing flexibility in the way complex problems are defined and addressed.

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EXECUTIVE SUMMARY

This deliverable is the second document of a series of actionable reports (so called 'cloud report') that have been produced by the BOOSTLOG consortium, covering different and comprehensive logistics domains (defined by BOOSTLOG as *clouds*). This deliverable focuses on assessing completed EU funded R&I Projects – from the 5th Framework Programme up to H2020 in the domain of **urban logistics**. In the figure below, the main projects working on the urban logistics topic are shown. Projects presented with the timeline reporting and also some relevant milestones of EU policies. Two milestones in EU policy related to R&I on urban logistics are the White Paper in 2011 that set the objective of achieving CO2-free urban logistics in major urban centres by 2030 and the definition of the SUMP concept in the framework of the Urban Mobility Package (UMP) in 2013. With SUMP, the Commission attributed to local actors the main responsibility to implement the needed actions to pursue sustainable objectives related to the urban context.

Figure 1. European funded R&I urban logistics projects

The main outcomes showcased in this document gravitate around three main topics:

1) Switch to sustainable vehicles
2) ICT for planning, coordinating, controlling logistics
3) Governance and networks

From an in-depth analysis of most relevant initiatives stemming from EU projects outcomes, the following implementation cases have been identified:

- Rome Logistics Living Lab
- SULP Topic Guide
- Padova Cityporto
- VISEVA-W – PTV
- Emilia Romagna Permit Portal
- Declaration of Intent: Electric Urban Logistics
- SEUL project

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Additionally, several companies and market initiatives have been identified: despite they do not have direct links with project outcomes are addressing similar problems bringing good solutions to the market.

In Table 1, the **targeted impacts** of the projects and the assessment of their readiness level (not just technical but also market, operational, etc) is layered into 6 levels: Not demonstrated (ND), Theoretical Demonstration (TD), Proof of Concept (PoC), Implemented Small Scale (including Niche Markets) (ISS), Implemented Medium Scale/Several Companies (IMS), Implemented Large Scale/Mainstream in Industry (ILS)

Table 1. Expected impacts, number of projects addressing it and readiness of the solutions

Targeted Impact	Nr. of projects	Status
Decrease of environmental impact in terms of GHG emissions, pollutants, and noise	18	IML
Increase transport efficiency (load factors, empty trips, shorter delivery routes, reduce failed deliveries)	16	IML
Reduction of congestion	15	IMS
Achieving and increase in modal shift to rail freight/waterways transport	1	ND
Decrease of overall transportation and logistics cost	9	ISS
Increased transport reliability and responsiveness	15	IMS
Decreased Travel Times	12	ISS
Improve energy consumption	7	POC
Improve long distance-city distribution connectivity	5	TD

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1 The BOOSTLOG project and scope of the deliverable

1.1 The BOOSTLOG project

Freight transport and logistics is facing critical challenges to address climate change, ensure supply chains are well functioning and people is served with required type of goods and services. In particular, cope with the expected growth of freight transportation and transition to zero emission logistics up to 2030 requires collaboration speeding up innovation.

BOOSTLOG Vision is transforming European freight transport and logistics R&I ecosystem to perform optimally[1] by boosting impact generation out of R&I investment contributing to i) EU policy objectives towards climate neutrality, pollution, congestion and noise reduction, free movement of goods, internal security, digital transformation of logistics chains and data sharing logistics ecosystems and ii) *Companies* sustainability and competitiveness generating value for society.

In order to do so, BOOSTLOG has identified 4 main areas of action: i) increase visibility and support valorisation of R&I project Results, Outcomes and Implementation Cases in the freight transport and logistics field ii) develop and implement valorisation strategies and guidelines to speed up the technological and organisational innovation uptake, including the creation of the Innovation Marketplace and issue recommendations to increase impact of R&I public funding, iii) Define high potential & priority R&I gaps to make efficient uses of R&I investments and iv) Strengthen R&I impacts communication and Stakeholders engagement in the innovation process.

In the framework of the first of those actions, BOOSTLOG has mapped and assessed more than 160 EU-funded R&D since FP5 in different freight transport and logistics domains (i.e. the Logistics *Clouds*), so as to develop at 8 comprehensive and industry actionable reports. The first issue of those report is the present document, that will focus on urban logistics.

These reports will be later complemented by deliverables on valorisation strategies and guidelines for public R&I uptake (WP3), an innovation marketplace for R&I uptake (D3.3) and the identification of high priority and potential R&I gaps that need to be prioritized in future R&I actions targeting policymakers (WP4).

1.2 Scope of this deliverable

In the framework of BOOSTLOG WP2, "From R&I projects results to impact generation", Task 2.1 focused on the analysis of the EU funded projects: gathering Outcomes, Implementation Cases in specific Clouds. The present deliverable shows the second report stemming from task 2.2, i.e. focussed analyses in selected Clouds: i) freight and logistics data sharing, ii) coordination & collaboration iii) urban logistics, iv) logistics nodes, v) multimodal freight, corridors & transport networks, vi) modularization and transhipment.

This report focuses on urban logistics, showcasing both outcomes and implementation cases directly contributing to the field. To avoid overlaps, some cases with a minor impact on this cloud have been left out

[1] R&I systems are complex ecosystems which need various elements to perform optimally. These include a solid public science base producing high quality outputs; strong business participation in innovation activities; fluid and abundant knowledge flows across R&I actors; and good framework conditions that allow business innovation to flourish. *European semester thematic factseet. Research & Innovation.* https://ec.europa.eu/info/sites/info/files/file_import/european-semester_thematic-factsheet_research-innovation_en.pdf

of this report as they will be later showcased in other cloud reports (such as coordination and collaboration or logistics data sharing).

Traditionally, urban logistics has been defined as "The movement of things (as distinct from people) to, from, within, and through urban areas." (Ogden 1992[2]) or "Those movements of goods that are affected by particularities associated to urban traffic and morphology." (Muñuzuri et al. 2005[3]). However, recently, some researchers (Rose et al 2017[4]), starting from the elicitation (Table 2) of several attempts aimed at defining urban logistics, argue that these previous definitions were overly simplistic and "focused on specific challenges or objectives instead of a holistic description of urban logistics".

Table 2. Evolution of the Urban logistics concept and scope

Concept	Definition
Urban Freight Transport	"All journeys into, out of, and within a designated urban area by road vehicles specifically engaged in pick-up or delivery of goods (whether the vehicle be empty or not, with the exception of shipping trips" (Hicks, 1977[5])
Urban Logistics	"The movement of things (as distinct from people) to, from, within, and through urban areas" (Ogden, 1992)
Sustainable Urban Logistics	"The process for totally optimizing logistics and transport activities by private companies in urban areas while considering the traffic environment, the traffic congestion, and energy consumption within the framework of a market economy" (Muñuzuri et al, 2005)
	"All coordinated measures comprising logistics collection and delivery activities of logistics service providers in urban areas that aims at the reduction or prevention of commercial traffic and its negative external effects" (Gammelgaard, 2015[6])

Recently Rze´sny-Ciepli´nska et al[7] provided an interesting reconstruction of the evolution of the concept and scope of urban logistics, starting from Taniguchi[8], who defined urban logisticsas "a process for totally optimizing the logistics and transport activities by private companies with the support of advanced

[2] Ogden, K. W. 1992 . Urban Goods Movement: A Guide to Policy and Planning . Burlington, VT : Ashgate Publishing, Ltd .

[3] Muñuzuri, J. , J. Larrañeta , L. Onieva , and P. Cortés . 2005 . "Solutions Applicable by Local Administrations for Urban Logistics Improvement." Cities 22 (1): 15 – 28 .

[4] Rose, W.J.; Bell, J.E.; Autry, C.W.; Cherry, C.R. Urban Logistics: Establishing Key Concepts and Building a Conceptual Framework for Future Research. Transp. J. 2017, 56, 357. [CrossRef]

[5] Hicks (1997), Urban Freight, in Hensher, D (Ed), Urban Transport Economics, Cambridge University Press.

[6] Gammelgaard (2005), The Emergence of City Logistics: The Case of Copenhagen's Citylogistik-kbh, nternational Journal of Physical Distribution & Logistics Management, 45 (4), 333-351

[7] Rze´sny-Ciepli´nska, J.; Szmelter-Jarosz, A. Stakeholders' Analysis of Environmental Sustainability in Urban Logistics: A Case Study of Tricity, Poland. Energies 2021, 14, 1274. https://doi.org/ 10.3390/en14051274

[8] Taniguchi, E. City Logistics. Infrastruct. Plan. Rev. 2001, 18, 1–16. [CrossRef]

information systems in urban areas considering the traffic environment, the traffic congestion, the traffic safety and the energy savings within the framework of a market economy".

Later, more emphasis was given to the stakeholders' cooperation, as one of the key aspects for implementing new solutions in urban freight transportation effectively[9],[10]. Following this approach, urban logistics was associated with freight transportation issues and was thus a point of interest of private businesses.

Then, among the urban logistics' actors, the role of public authorities started to be analysed [11],[12]. Nowadays, much review-based research has been conducted to analyse urban logistics more precisely and widely . According to these studies, the notion of urban logistics is defined as a coordination process of all the flows within urban areas—freight and passengers [13],[14]. More accurately, urban logistics is defined as a set of practices related to the movements of things and people [15] and their management, which plans, organizes, implements, and controls the efficient flows and related information [16] in order to meet all urban transport system stakeholders' demands. Additionally, these practices aim to reduce or prevent commercial traffic and its adverse external effects [17].

These last development on urban logistics concept are also in line with the newly published EC's New Urban Mobility Framework [18] approach, which highlight the importance of the engagement and collaboration between local authorities and private stakeholders to optimising urban logistics and last-mile delivery in economic, social and environmental terms referring .

According to the evolution of Urban logistics concept, Implementation cases and projects selected for the urban logistics topic are different from the first cloud report on Coordination & Collaboration which focused on commercial implementation and creation of business.

Today, the landscape of urban logistics has been shaped by many EU funded projects that had been a pioneer on many new solutions, results in changes in policy and business models. As urban environment is complex, concrete implementation in business model and policy can take very long time. However, the BOOSTLOG

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[9] Hensher, D.A.; Puckett, S.M. Refocusing the Modelling of Freight Distribution: Development of an Economic-Based Framework to Evaluate Supply Chain Behaviour in Response to Congestion Charging. Transportation 2005, 32, 573–602. [CrossRef]

[10] Iguín-Veras, J.; Silas, M.; Polimeni, J.M. An investigation into the attitudinal factors determining participation in cooperative multi-carrier delivery initiatives. In Innovations in City Logistics; Nova Science Publishers: Hauppauge, NY, USA, 2008; ISBN 9781604567250

[11] Miller, J.; Nie, Y.; Stathopoulos, A. Crowdsourced Urban Package Delivery. Transp. Res. Rec. J. Transp. Res. Board 2017, 2610, 67–75. [CrossRef]

[12] Cherrett, T.; Allen, J.; McLeod, F.; Maynard, S.; Hickford, A.; Browne, M. Understanding urban freight activity—key issues for freight planning. J. Transp. Geogr. 2012, 24, 22–32. [CrossRef]

[13] Quak, H.; Balm, S.; Posthumus, B. Evaluation of City Logistics Solutions with Business Model Analysis. Procedia Soc. Behav. Sci. 2014, 125, 111–124. [CrossRef]

[14] Marcucci, E.; Le Pira, M.; Carrocci, C.S.; Gatta, V.; Pieralice, E. Connected shared mobility for passengers and freight: Investigating the potential of crowdshipping in urban areas. In Proceedings of the 2017 5th IEEE International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS), Naples, Italy, 26–28 June 2017; pp. 839–843.

[15] Muñuzuri, J.; Cortés, P. Recent advances and future trends in city logistics. J. Comput. Sci. 2012, 3, 191–192. [CrossRef]

[16] Rose, W.J.; Bell, J.E.; Autry, C.W.; Cherry, C.R. Urban Logistics: Establishing Key Concepts and Building a Conceptual Framework for Future Research. Transp. J. 2017, 56, 357. [CrossRef]

[17] Gammelgaard, B. The emergence of city logistics:The case of Copenhagen's Citylogistik-kbh. Int. J. Phys. Distrib. Logist. Manag. 2015, 45, 333–351. [CrossRef]

[18] https://transport.ec.europa.eu/system/files/2021-12/SWD_2021_470.pdf

project aims to acknowledge those pioneer projects that have initiated discussions and policy developments in urban logistics, even though concrete implementations have not yet completed. This document focuses on assessing the R&I results, outcomes and implementation cases in the field of urban logistics, defining next steps to reach impact and contribute to freight transport efficiency and to support addressing Climate Change. The present report focuses on the Urban logistics cloud identified under the framework of BOOSTLOG.

2 Introduction and methodology

2.1 Background

Despite the efforts of Governments and Companies, greenhouse gas emissions from the EU's transport increased in 2018 and 2019 and have not followed the EU's general decreasing emissions trend. National forecast by the European Environment Agency shows that transport related emissions in 2030 will remain above 1990 levels, even implementing measures currently planned and activated by EU Member States[19].

According to Alan McKinnon[20], freight transport will be the hardest economic sector to decarbonize because it relies very heavily on fossil fuels and the demand for freight transport is expected to rise sharply over the next few decades. Total freight transport in the EU is projected to further increase by 51% during 2015-2050 under current trends[21]. The objective for transport, that accounts for a quarter of the Union´s GHG emissions, is to achieve a 90% reduction in emissions by 2050.

Focusing on urban logistics:

- The 2011 White Paper[22] set the goal to achieve "essentially CO2-free city logistics in major urban centres by 2030 with the aim of an 'essentially carbon free' city logistic by 2030.
- In 2013, the Commission adopted the Urban Mobility Package, which gives actors and local authorities the main responsibility for taking measures to pursue more sustainable urban mobility. They are encouraged to develop integrated strategies for sustainable urban mobility, as well as transport plans that can support their effective implementation; in this context, the Commission proposed a concept of sustainable urban mobility plans (SUMPs)
- With the 2020 EC Communication[23] the commission recognised and emphasised the importance of the inclusion of logistics in urban mobility planning "The growth of e-commerce has significantly changed consumption patterns, but the external costs of millions of deliveries, including the reduction of empty and unnecessary runs, must be factored in. Hence, sustainable urban mobility planning should also include the freight dimension through dedicated sustainable urban logistics plans. These plans will accelerate the deployment of zero-emission solutions already available, including cargo

[19] European Environment Agency (2020). *Greenhouse gas emissions from transport in Europe*

[20] McKinnon, (2018)A. Decarbonizing Logistics: Distributing Goods in a Low Carbon World; Kogan Page, London, UK

[21] SWD (2018) 183 final - PART 1/2. *IMPACT ASSESSMENT Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on electronic freight transport information.*

[22] COM (2011) 144 final, "White Paper – Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system". The Commission has also evaluated this White Paper in SWD (2020) 410 and SWD (2020) 411.

[23] COM (2020) 9.12.2020 COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS "Sustainable and Smart Mobility Strategy – putting European transport on track for the future"

bikes, automated deliveries and drones (unmanned aircraft) and better use of inland waterways into cities"

- With the New Urban Mobility Frameworks the EC, starting from the evaluation of the 2013 Urban Mobility Package that highlighted that the urban logistics was not addressed enough in existing SUMPs,[24] requires more efforts to ensure that the existing sustainable urban logistics plans (SULPs) are better embedded in the SUMP framework. This would help to achieve the goal of zero-emission urban logistics by 2030. In this sense "the deployment of rapidly developing and sustainable solutions such as cargo bikes therefore needs to be accelerated, using new distribution models, dynamic routing, and a better connected use of urban rail and inland waterways. This will support optimisation of the use of vehicles and infrastructure and reduce the need for empty and unnecessary runs".

Despite the fact that the impacts of urban logistics on the liveability of urban areas have been recognised for more than a decade now, the last mile continues to be the most inefficient portion of freight transport. It is estimated that every year in Europe €100 billion is burnt due to inefficiencies related to URBAN LOGISTICS, equivalent to 1% of GDP. Indeed, Urban freight accounts for a significant part of ambient **noise** in cities and impacts air quality as it generates 30 to 50% of transport-related pollutants such as particulate matters (PM) or Nitrogen Oxide (NO_x)[4]. Growing demand for e-commerce delivery will result in 36% more delivery vehicles in inner cities by 2030, leading to a rise in both emissions and traffic congestion without effective intervention. Without effective intervention, urban last-mile delivery emissions and traffic congestion are on track to increase by over 30% in the top 100 cities globally[25]

In addition, changes in consumer behaviour, new e-commerce services, instant deliveries and the COVID-19 pandemic, together with traditional goods movements, are causing an increase in last-mile deliveries and putting pressure on urban environments.

In particular, while e-commerce has granted consumers with more advantageous purchasing conditions, it is also generating a proliferation of micro-deliveries to homes and a fragmentation of shipments that have actually increased diseconomies in the distribution cycle by generating huge flows of commercial vehicles with very low load factors.

This leads to a series of inefficiencies; a joint study by Roland Berger and FM Logistics tried to quantify these impacts:

- 30% of first attempts at direct-to-consumer delivery fail
- 0.1 deliveries per person per day. This means that in Rome, with its approximately 2.9 mil inhabitants, about 290k direct-to-consumer deliveries are made every day.
- The return of goods is estimated to be around 10%, which means a doubling of trips.
- This means that 30% of emissions in urban areas are linked to logistics activities; this is also due to a low rate of innovation in the sector, which would allow more efficient management of deliveries, but also to a very old fleet of vehicles used for deliveries, which therefore generates more emissions for the same number of kilometres travelled.
- In addition, 20% of urban traffic is related to logistics activities.

[24] The 2021 Fact-finding study found that, although 68% of the EU cities sampled were aware of the sustainable urban logistics plans (SULP) guidelines, only 13% have a dedicated SULP, while 58% have logistics elements in their sustainable urban mobility plans

[25] World Economic Forum (2020). The Future of the Last-Mile Ecosystem. Transition Roadmaps for Public- and Private-Sector Players

- Moreover, in recent years, fast delivery services have been made available, such as Amazon Prime, which from 2019 will offer 24-hour delivery; it is estimated that on average, fast delivery, due to the inefficiencies it causes, pollutes about three times as much as more time-consuming deliveries. (In fact, if in general terms it is possible to think that a single van delivering to several clients could reduce the circulation of private cars, this becomes impossible when, in order to make more urgent deliveries, the vans leave the warehouses almost empty).
- All this in the context of forecasts, made by the same study, that see a growth of at least 8% of the urban logistics market between now and 2030.

The European Green Deal[26] sets out a detailed vision to make Europe the first climate-neutral continent by 2050. Recently, the Commission increased 2030 emissions reduction target of net 55 % compared to 1990 levels, from the previous 40 % emissions reduction target[27] and to implement the increased ambition, on 14 July 2021 the Commission presented the first series of adopted files under the 'Fit for 55' package.[28]

More than 934 companies have committed to science-based targets, with some pledging to reach zero emissions by 2050[29] and many of them including freight transport and logistics within their scope.

In 2014 ALICE published its research and innovation Roadmap *on Urban Freight* to identify research priorities related to urban freight delivery, returns and urban logistics to improve the efficiency, sustainability and security of this activity.

More recently ALICE and POLIS launched their joint guide[30] for "advancing together towards zero-emission urban logistics by 2030 – a milestone of the consolidated POLIS-ALICE Urban logistics Strategic dialogue". The document address five key areas of intervention:

- **Smart governance and regulations.** Clear targets and plans focussed on logistics need to be worked out with stakeholders. Knowledge and alignment across cities and countries facilitate companies to adopt economies of scale and lowering costs.
- **Clean & alternative fleet.** Vans and trucks will continue to play a central role, while the use of small electric vehicles and cargo-bikes will increase considerably. New business and operational models are needed for their upscale integrating energy infrastructure and logistics operations.
- **Logistics operations.** Consolidation of flows, enabled by new models of collaboration, sharing of vehicles and infrastructure (e.g., Physical Internet principles) should become the norm as well as decouple transport and delivery solutions (e.g. pick up points, lockers, etc.).
- **Purpose-oriented data acquisition and sharing.** Interaction between companies and local authorities increases and will be facilitated by digitalization and pan-European open standards and protocols enabling seamless collaboration and information -based policies and measures.

[26] COM (2019) 640. *The European Green Deal.* Brussels

[27] COM (2020) 562. *Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people*

[28] Package fit for 55 (https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/package-fit-for-55)

[29] https://sciencebasedtargets.org/

[30] https://www.polisnetwork.eu/news/polis-and-alice-launch-joint-guide-for-advancing-together-towards-zero-emission-urban-logistics-by-2030/

- **Consumer engagement.** More transparency on implications of delivery choices will empower consumers to influence the market

2.2 Why improving urban logistics? Challenges and expected positive impacts

Considering that urban logistics account for a significant share of urban traffic and emissions, efficiency gains in the sector can help cities in improving liveability and tackling their decarbonisation goals. Beyond that, is essential to highlight that Urban logistics is also essential to ensure the optimal functioning of cities, as they are an integral part of regional, national and international supply chains, contributing to the economical vitally of urban areas.

ALICE' Roadmap *on Urban Freight* includes research challenges in five areas of intervention with the following expected impacts:

Table 3. Challenged and expected impacts identified in the ALICE' Roadmap on Urban Freight by area of intervention

Challenge	Impact
Identifying and assessing opportunities in urban freight	• Increase load factors. • Reduce freight vehicle movements. • Increase effectiveness • Reduce congestion
Towards a more efficient integration and management of urban freight in the transport system of the city	
Towards a more efficient integration of urban freight in the urban transport system	• Increase the number of available loading/unloading zones • Reduce the average number of kilometres per vehicle • Increase asset utilization
Better understanding of the impact of land use on urban logistics activities	• Increase the number of available loading/unloading zones • Reduce the average number of kilometres per vehicle • Create opportunities for the use of shorter-range, but more energy and emission efficient vehicles. • Increase the load factor of vehicles • Properly locate the available loading/unloading zones
Enabling a more efficient management of goods	• Reduce the number of km per vehicles • Increase the load factor of vehicles • Increase the rate of available loading zones
Improving the interaction between long distance freight transport and urban freight	• Reduce the average number of kilometres per vehicles • Optimise the network of consolidation/transhipment centres • Allow the use of electric vehicles for last mile deliveries
Better adapting the vehicles to innovative urban freight delivery systems	• Increase the load factor of vehicles • Reduce the number of km per vehicle • Increase the availability of loading and unloading areas
Business Models and Innovative Services	
Value creation logistics services and more efficient operations	• Increase load factors. • Increase asset/infrastructure utilization. • Reduce freight vehicle movements. • Increase first time delivery.

	• Increase customer satisfaction
e-commerce implications: Direct to consumer deliveries and functional logistics services	• Maintain/Increase load factors. • Reduce private vehicle movements. • New business opportunities increasing employment. • Increase first time delivery. • Increase customer (including ageing) satisfaction
Reverse logistics and transport of waste and recycling material	• Increase load factors. • Increase asset/infrastructure utilization. • Reduce freight vehicle movements. • Increase customer satisfaction. • New business opportunities increasing employment. • Improve urban transportation policies
Designing and operating urban freight delivery infrastructures	• Increase the load factor of vehicles • Reduce the average number of km per vehicles • Reduce the environmental impacts of logistics buildings
Safety and security in urban freight	• Reduce cargo lost. • Reduce accidents involving vulnerable road users
Cleaner and more efficient vehicles	• Reduce the emissions of pollutants from the vehicles • Increase the energy efficiency of the vehicles • Increase the availability of loading and unloading areas • Reduce the noise of urban freight • Enable night distribution

In the following table there is a compilation of the expected impact from the R&I projects that improved (at different level of impacts) urban logistics:

Table 4. Expected Impacts KPIs and projects addressing them

Expected Impact	KPIs	Projects
Decrease of environmental impact	CO2 emissions	CITYLAB, NEXTRUST, NOVELOG, SUCCESS, U-TURN, MOSCA, CITY MOVE, DELIVER, CIVITAS ECCENTRIC, FREVUE, FURBOT, OPTICITIES
	Local pollutants	CITYLAB, NEXTRUST, NOVELOG, SUCCESS, U-TURN, MOSCA, CITY MOVE, DELIVER, CITY FREIGHT, FREVUE, FIDEUS, FURBOT, SMARTFUSION, STRAIGHTSOL, V-FEATHER, VITALNODES
Increase transport and logistics efficiency	Increase load factors	CITYLAB, NEXTRUST, NOVELOG, SUCCESS, CITYLOG, DELIVER, FIDEUS, FURBOT, STRAIGHTSOL, , V-FEATHER
	Reduce empty trips/kms	NEXTRUST, FURBOT, eDRULS
	shorter delivery routes	CITYLAB, NOVELOG, SUCCESS, U-TURN, MOSCA, FURBOT, INSTANT MOBILITY, OPTICITIES
	Reduce failed deliveries	CITYLAB, U-TURN, CITYLOG, CITY FREIGHT, FIDEUS, INSTANT MOBILITY, eDRULS
Reduction of congestion on the road network	Reduced vehicles movements /Nr. of vehicles	CITYLAB, NEXTRUST, NOVELOG, SUCCESS, U-TURN, MOSCA, CITYLOG. CITY FREIGHT, FREVUE, FIDEUS, OPTICITIES, VITALNODES
	Reduction of average trip time	CITYLAB, MOSCA, FURBOT, OPTICITIES, eDRULS

	Increase in average travel speed	CITYLAB, DELIVER
Achieving and increase in modal shift to rail freight/waterways transport	Create new intermodal connections	NEXTRUST
	Absolute productivity of various transport modes in ton*km	n.a.
	Market share in % per mode, measured in ton*km	n.a.
Decrease of overall transportation and logistics cost	Cost/unit of transport	CITYLAB, NOVELOG, SUCCESS, U-TURN, NEXTRUST, CITY MOVE, FREVUE, FURBOT, STRAIGHTSOL
Increased transport reliability and responsiveness	On time delivery	CITYLAB, MOSCA, CITYLOG, INSTANT MOBILITY
	Better customer service	CITYLAB, NEXTRUST, NOVELOG, MOSCA, CITY MOVE, CITYLOG, DELIVER, CIVITAS ECCENTRIC, FREVUE, FURBOT, INSTANT MOBILITY, OPTICITIES, SMARTFUSION, STRAIGHTSOL, EDRURBAN LOGISTICS
Decreased Travel Times	Reduced Travel time	CITYLAB, NEXTRUST, SUCCESS, MOSCA, CITY FREIGHT, CIVITAS ECCENTRIC, FURBOT, INSTANT MOBILITY, STRAIGHTSOL, V-FEATHER
Improve energy consumption	Energy consumption/unit of transport	CITY MOVE, CITYLOG, DELIVER, CIVITAS ECCENTRIC, FREVUE, FURBOT, SMARTFUSION, V-FEATHER
Improve long distance-city distribution connectivity	% Decrease in operational handling	NEXTRUST, CIVITAS ECCENTRIC, SMARTFUSION, STRAIGHTSOL, VITALNODES

2.3 Defining areas of intervention, solutions and Key factor of success

In order to address the challenges brought by urban logistics operations, including impacts on liveability, congestion, air pollution, CO2 emissions, noise, health and safety, resilience, and costs to the companies, ALICE-ETP & POLIS (2021) joint guide identifies five areas of intervention, solutions and Key factor of success, providing recommendations for

- Companies,
- Local Authorities,
- National governments, research & development partners and academia
- civil society and citizens

with the elicitation and description of the activities to be undertaken by each stakeholder group for each solution area.

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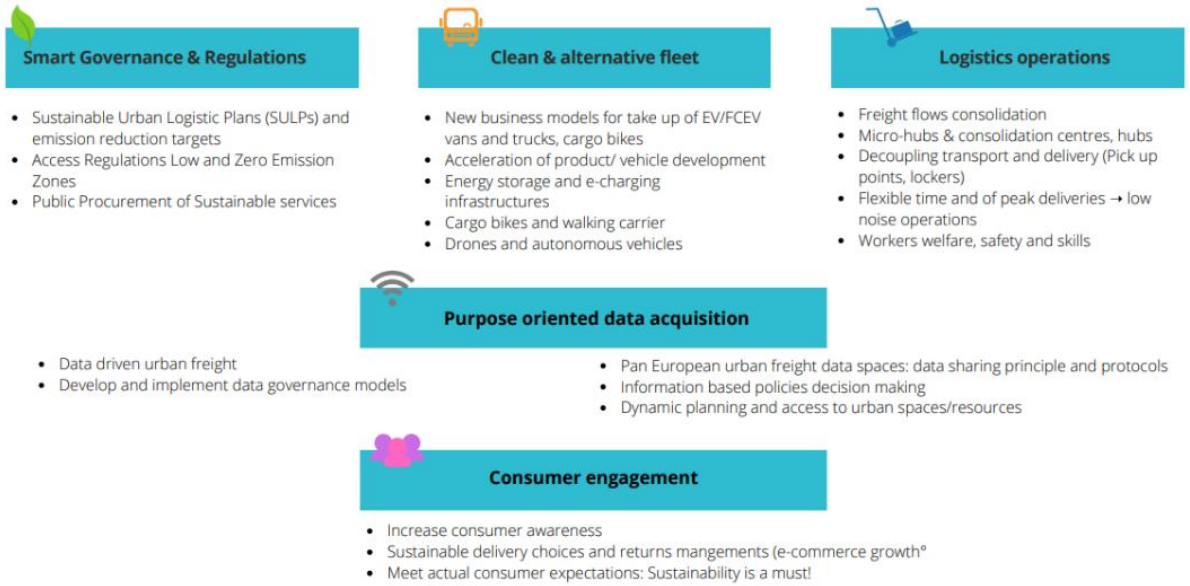

Figure 2. Main areas of intervention to address the challenges associated to urban logistics(source: POLIS and ALICE - joint guide for advancing together towards zero-emission urban logistics by 2030)

2.4 Barriers and guidelines to achieve the benefits of an optimised and sustainable urban logistics

The following table summarises the main barriers identified by Key existing global roadmaps and white papers on urban logistics in the last four years. The barriers identified by the experts interviewed in the semi-structured interviews (see following chapters) are consistent with these macro-categories. The contents of the roadmaps were aggregated and disaggregated in order to provide a clear and harmonised overview. The contents of the cells report the main titles/bullet points of the analysed roadmaps and are not intended to be exhaustive. The different roadmaps are structured differently and provide more or less exhaustive titles. For more complete and contextualised information it is advisable to refer to the individual documents. In this sense, this table is only intended to provide an overview of the main actions aimed at overcoming the main barriers that hinder the pursuit of more efficient and sustainable urban logistics.

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BARRIERS	Key existing global roadmaps and white papers on urban logisticsin the last four years				
	POLIS-ALICE Guide for advancing towards zero-emission urban logisticsby 2030	Urban logisticsfaced with economic and environmental challenges	The Future of the Last-Mile Ecosystem. Transition Roadmaps for Public- and Private-Sector Players	Zero Emission Urban Freight	How-to Guide on Zero-Emission Zones for Freight
FEAR OF SHARING DATA BETWEEN COMPANIES AND CITIES	- Data driven urban freight - Develop and implement data governance models - Pan European urban freight data spaces: data sharing principle and protocols - Information based policies decision making - Dynamic planning and access to urban spaces/resources		- First, private-sector players – especially automotive OEMs, logistics players and infrastructure providers – need to embrace the shift from hardware to an increasing number of software solutions and accelerate their efforts in the analytics sphere, enabling the use of real-time routing and tour-planning solutions, smart load-pooling, flexible pricing offerings etc. - Second, cities need to embrace their role as vital and central players in urban mobility. Gone are the days when cities courban logisticsd focus on fixing potholes and building yet another bypass.	- Neutral, trustworthy platform for data sharing - Freight transport delivery mapping	
LACK OF COOPERATION AMONG ACTORS		Strengthening cooperation between stakeholders to create a more efficient logistics ecosystem	Firms and cities to accelerate pragmatic intervention pilots, especially in mid-sized cities that do not have the innovation and traffic management budget of forward-thinking metropolises such as New York and London. This courban logisticsd include projects based on murban logisticstibrand parcel lockers and night-time deliveries. Also, we believe new financing models beyond conventional public procurement will become relevant need for city platforms or forums in which public-sector players of all sizes can exchange the most effective methodologies, report	- Regional consolidation centre - Green Deals between companies, civil society organisations and local and regional government	

			back from successful last-mile pilots, interact with businesses and discuss which evolutionary interventions can be implemented now and which revolutionary measures must be prepared to accelerate implementation in the upcoming decade.		
Lack of knowledge and awareness	Local Authorities to develop inhouse knowledge on freight transport and logistics			- Labelling and certification programme - Standardised measurement methodology - Dissemination of this whitepaper and other relevant documents to Countries, Cities and Companies stakeholders - More (online) low threshold courses for practitioners	
Space as the scarcest resource	- Develop and manage shared spaces - curb side management - Flexible and broad delivery options including off-peak and night deliveries - Companies openly collaborate and share information and data with public authorities, including access to loading and unloading spaces - Fast-track dynamic planning and access to urban spaces, zones and resources	Rethinking scarce and saturated logistics spaces			
Proliferation of B2B deliveries	Decoupling transport and delivery (Pick up points, lockers)				
Increasing customer expectations	- Increase consumer awareness - Sustainable delivery choices and returns mangements (e-commerce growth° - Meet actual consumer expectations: Sustainability is a must!			- Green choice for customer/citizen - Automated locker boxes - Merchandise pick-up points - Micro-distribution - ocal urban delivery platform - Individually optimised transport solution	
Operators' reluctance to renew fleets LACK OF	- New business models for take up of EV/FCEV vans and trucks, cargo bikes - Acceleration of product/ vehicle development			- Financial incentives for acquisition of clean freight vehicles	

ECONOMICALLY ATTRACTIVE VEHICLE OPTIONS FOR SMOOTH TRANSITION	- Energy storage and e-charging infrastructures - Cargo bikes and walking carrier - Drones and autonomous vehicles			- Research charging options for trucks - Showcase demand for more electric vehicle options for large-scale freight fleets - Support investments in public charging infrastructure Low-cost electric tilting 3-wheel vehicle - Leasing (batteries) instead of purchase - Total cost of ownership as the new standard	
High operational complexityand, high fragmentation of the freight sector and low margins	- Freight flows consolidation - Micro-hubs & consolidation centres, hubs - Flexible time and of peak deliveries→ low noise operations			- Mutualised management demand and capacity platforms enabling increased efficiency and effectiveness - Delivery as a service for businesses	
DIVERSITY OF SUPPLY CHAINS AMONG SHIPPERS AND RECEIVERS				- Bike couriers - City distribution by boat - Mobile depots - Co-modality	
URBAN FREIGHT PLANNING; Freight is often seen as a private sector issue -- >lack of a systemic vision	- Sustainable Urban Logistic Plans (SULPs) and emission reduction targets - Access Regulations Low and Zero Emission Zones - Public Procurement of Sustainable services	Establishing common standards: Merging the interests of the public with those of logistics coordinators		National freight decarbonisation plan Land use planning policies Green urban planning Diversified driving licence legislation to promote ZEV Multi-purpose use of space Sharing city hubs and warehouses Sharing fleets	
LACK OF LOADING AND UNLOADING SPACES				Incentives to shift loading and unloading times to non-peak hours Longer heavier vehicles (LHVs) or eco-combi	
Oppositions to the creation of Urban Vehicle Access Regulation (UVAR)				- Zero emission vehicles(ZE) procurement - Zero Emission Zones (ZEZ) - Collective pre-order of freight low emission vehicles	- Build trust with stakeholders throughout the broad freight community - Clarify city's objectives and regulatory powers

					- Set an ambitious but realistic target and timeline - Develop an implementation strategy - Test and pilot your desired interventions - Implement, monitor, fine-tune…and enforce
New technologies and solutions scepticism			Creating a robust, consistent and globally binding regulatory landscape for vital technologies such as autonomous driving, emissions and multi-brand delivery solutions would be tremendously beneficial for improving predictability, strategic investment planning and, ultimately, road safety.		

2.5 Methodology

These *cloud reports* include a brief highlight of the main Challenges, past and current specific **pain points** in a given Cloud, key R&I results, that have resulted in Outcomes and key milestones achieved such as Implementation Cases, establishing causal links between the EU R&I funding and innovation supporting the seamless integration and harmonization of transport modes, the more efficient management of physical information and financial flows, reducing negative impacts, such as carbon emission and congestion, ensuring free and seamless movement of goods and enhancing digital transformation.

This reports contain clear actionable items, such as cases on how to implement the Outcomes or build on the Implementation Cases.

The methodology to develop this report is shown in Figure 3. First, BOOSTLOG analyses the EU R&I results to identify key outcomes. The outcomes are then analysed based on the achieved TRL of the project results and further development.

The organizations with most frequent participation in projects, for each Cloud, are mapped, as well as individual people from those organizations participating in the projects considered (i.e., notably our "experts").

Semi-structured interviews (see Annex 2) have been undertaken to the experts, to validate the outcomes and gather additional missing information that are relevant to the scope of the analysis, as well as to investigate which Outcomes have rolled out into Implementation cases (i.e. they have been implemented and adopted by the freight transport and logistics stakeholders).

The survey results have been the primary input for a BOOSTLOG cloud report, and it is complemented with desk research carried out on most relevant projects deliverables and communications, market/sector current practice analysis and the market solutions implemented and adopted including examples of Implementation Cases. The first release of a report is submitted to the experts to get opinion leader feedback. Additionally, a complementary discussion is done in an online cloud-related working session (workshop) for final validation of the report.

The final (validated) report will be presented in a webinar, where the ALICE members and other relevant influencing stakeholders are invited as BOOSTLOG partners networks.

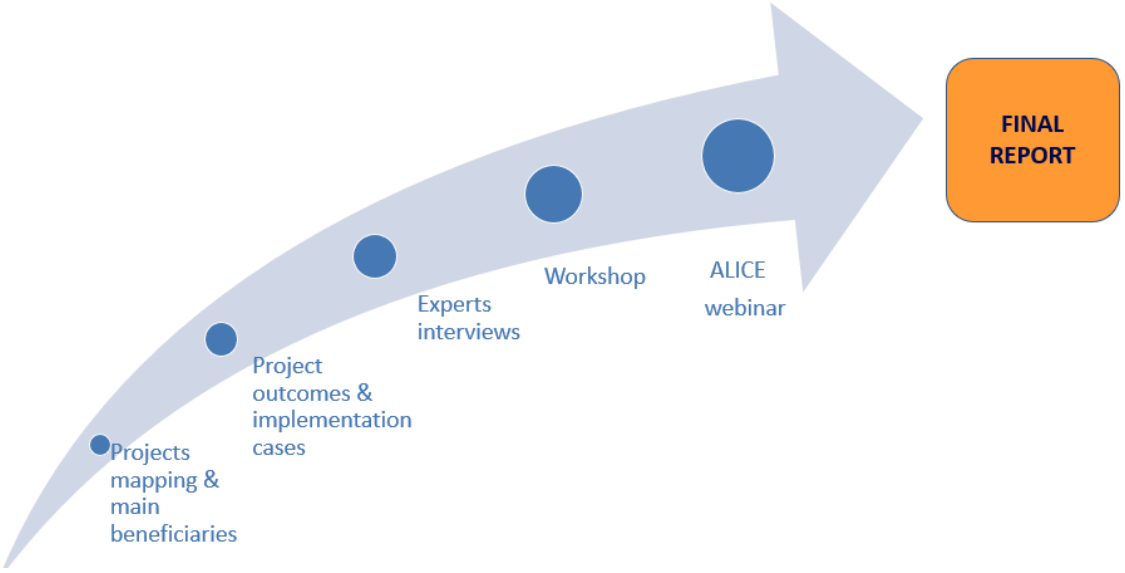

Figure 3. Methodology for the development of a BOOSTLOG cloud report

3 Market analysis of current practices

Currently one can see in the market new companies that have arisen around the topic of urban logistics, as it can be seen below:

- **Gel Proximity** is a B2B platform that connects logistics operators and couriers to innovative last mile logistics services. GEL Proximity is a 'technological connector' that facilitates relations and fosters the exchange of information among collection points and lockers in the online sales framework. GEL Proximity brings together tens of thousands of available collection points, that are part of some of the largest delivery networks, with PUDO points such as PuntoPosta network, Ups Access Points, TNT Points, InPost Lockers, new stands of 1A Edicola network. GEL Proximity improves the online shopping experience thanks to multiple and customizable delivery options.
- **Last Mile Team** is a Spanish technology company focused on last mile delivery. It is an innovative deep-tech start-up that has developed a solution based on an AI[31] powered urban goods distribution. In turn, this solution exploits a registered IP, taking in account local, national and European applicable regulations, using a combination of algorithms and processes aimed to optimize the routes thought the balance of legal, environmental and emission restrictions. Further, any other city or zone-specific restrictions are considered. It simultaneously offers companies of any size the possibility to easily incorporate into their distribution operations a level of customer experience, optimization, visibility comparable to Amazon or Uber. Last Mile Team operates in Spain, where its first pilot is already underway, providing its service to three companies and about 150 users. At the same time, it is considering the possibility to spread in the US market. Last Mile Team has an expertise in the development of Digital Twins to model scenarios and in

[31] Artificial intelligence, a computer technology which aims to make machines work as the human mind.

running simulations and test solutions through machine learning to all the supply chain road transport echelons, from long-haul to last mile or reverse logistics.

- **La Petite Reine** provides an optimized delivery service that improves the quality of life in the city center, reducing the effects of air pollution. La Petite Reine is specialized in urban logistics and it aims to achieve clean and silent deliveries. The company, which is a member of the Star Service group for 10 years, ensures food and parcels deliveries by appointment in Cargocycle® or two-carrier. These types of vehicles, manufactured in France, have a loading capacity of 180 kg that allows to ensure complete rounds of deliveries while controlling the cold chain regarding foodstuffs. Each year, more than 85,000 zero emission and zero noise deliveries are provided by La Petite Reine. In fact, the vehicles fleet does not emit CO2 or other particles: Cargocycles® fleet is formed by electrically assisted bicycles and electric vehicles. The vehicles contribute to reduce pollution in the city and their small sizes limit the congestion in urban areas. It is used, under controlled temperature, in Intra-urban logistic for food and non-food goods deliveries in limited time slots.
- **Hytchers** is a distribution solution that allows e-commerce parcels to be delivered by private individuals. The service provides the coordination of independent carriers stops along the collection points in order to collect parcels for the onward delivery. These carries - the "hytchers" - are notified along their route, about sending parcels, by messages received in a smartphone application. Like the hitch-hiking concept, parcels go from one point to another, carried by one deliverer to another, until they finally reach their ultimate destination. Parcels will also be traceable in real time by the recipient. As a resul, a sustainable value for customers, hytchers and the company is generated. To achieve a wide network of collection points, Hytchers has a partnership with Total and Europcar to make their stations/agencies available for the deliveries, which are cheap and 100% ecological to their customers.
- **Velove** aims to create liveable city centres developing an ecosystem of micro hubs and an e-cargo bikes which handle last-mile deliveries for e-commerce consumers. Velove provides a pioneering ecosystem of smart city hubs and containerised cargo bikes to reorganize city logistics with the aim to replace vans and cars on a large scale. Velove uses the Velove Armadillo, a four-wheel vehicle focused on cargo cycle which is suitable for last mile delivery and for bike paths. City hubs, together with connected containerised vehicles, creates a brand-new platform where logistic companies can upgrade to the next level of last mile delivery. The solution improves energy, resource as well as space use, noise and emissions efficiency. Since 2020, when the activity has started, Velove has delivered more than 500 000 packages in Stockholm, aiming to spread in the markets across Europe. Currently it is in Stockholm, Gothenburg and Copenhagen.

Building upon the above current market practices, the upcoming sections will showcase **further initiatives stemming from projects outcomes and implementation cases.** As it can be seen below, several of these initiatives have successfully been implemented and are currently operating in the market:

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4 Project Results and Outcomes

In the BOOSTLOG Urban logistics Cloud, 21 EU R&I projects have been considered and assessed as significant contributors to increase this specific domain. The pool of cloud-related projects has evolved over 20 years, starting from a smaller set of 2 funded projects in FP5, that greatly increased in the following Framework Programmes (as showed in the Figure 4).

The FP5 and FP6 projects focused on two main themes: definition of guidelines, roadmaps and recommendations and developing ICT tools for vehicle routing and transport planning (information and communication technologies (ICT) tools, such as a pre-trip planner, ad hoc maps, dynamic assisted navigation and last-mile parcel tracking were developed) . FP7 projects instead paid most of the attention on reducing the environmental impact of urban distribution, by studying/testing low emissions vehicles. More recently, the Horizon 2020 projects aimed at creating positive frameworks for the implementation of different solutions, with living labs establishment, addressing governance and facilitating the adoption of Sustainable Urban Mobility/Logistics Plans.

Figure 4. Urban logistics projects in the R&I programmes (FP5, FP6, FP7, and HORIZON2020)

The main focus of all these projects gravitate around three main topics: Switch to sustainable vehicles (see par. 3.1), ICT for planning, coordinating, controlling logistics (3.2), Governance and networks (3.3).

The key outcomes achieved in each project may vary from specific technology developments, new business models, policy related contributions (including guidelines and roadmaps) and service/product related accomplishments. Technology is the main outcome of these projects, mainly development or testing of Sustainable vehicles and ICT tools for planning, coordinating, controlling logistics

The key outcomes that are correlated to the BOOSTLOG Urban logistics Cloud are described in Figure 5.

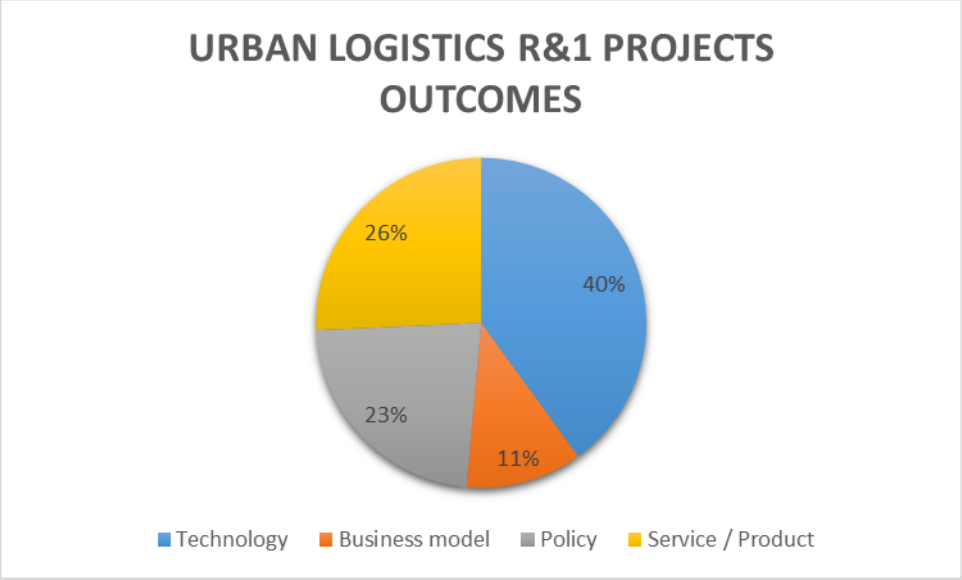

Figure 5. Urban logistics projects outcomes

4.1 Switch to sustainable vehicles

Several cloud related projects, mainly in the FP7, aimed at developing or testing new vehicle-related solutions

CITY MOVE has developed a new concept for urban delivery. Starting from the latest state-of-the-art technologies, which were adopted in the short-term, CITY MOVE has developed an innovative freight vehicle solution suitable for different needs of European cities. The solution of an industrial platform for freight transport vehicles has been designed to be adaptable and flexible to changes in the city commercial contest. The project aimed to develop an innovative and flexible vehicle, green and safe, purpose-designed for urban freight. Safety systems, regarding collision, roll-over avoidance and protection for vulnerable road users, were improved in the CITY MOVE vehicle. The project also created an exploitation plan, which results have provided opportunities for European business. The impact of CITY MOVE work was related to transportation efficiency, cleaner and quieter vehicles and it improved safety. The aim was to improve local air pollution and aid to achieve international emissions targets.

DELIVER aimed to develop a relevant impact on urban context thanks to the strong involvement of leading industrial partners. To achieve its goal, the project generated, investigated and analysed innovative design concepts for electric LDVs. While the majority European delivery vehicles were normal cars or trucks, not designed for freight transportation, DELIVER (Design of electric light vans for environment-impact reduction) aimed to design a more ergonomic vehicle thanks to updates of standard vehicle procedures, including payload area and engine systems. A further goal was a general increase in energy and delivery efficiency. The consortium completed the prototype in April 2014. The team continued with successful testing about driving dynamics, acoustics, ergonomics, electromagnetic efficiency and compatibility. DELIVER's new van offered a design that is more ergonomic, comfortable, efficient. Using the vehicle, fuel savings and improved air quality are foreseen in the future.

FREVUE demonstrated that electric vehicles operating "last mile" freight movements in urban centres can offer significant and achievable decarbonisation of the European transport system. The aim of the project was

to demonstrate that the current electric fleet can offer a viable alternative to diesel vehicles - particularly when combined with state-of-the-art urban logistics applications, innovative logistics management software, and enhanced by a well-designed local policy. The project aimed to find solutions to implement EVs sector thanks to the support of European researchers. The final overall objective was to foster the exploitation of the best practice results through a targeted dissemination campaign aimed to reach the decision makers of logistics industry. FREVUE has created a network of "Phase 2" cities to directly share the lessons learned from the demonstrators. These cities were expected to be the first cities to expand the successful concepts developed by FR-EVUE.

FURBOT proposed new concept architectures for efficient sustainable urban freight transport and it has developed a vehicle prototype to demonstrate the performances expected considering the main paradigms of the new vehicle design. FURBOT represented a transport agent that can be used alone or in a fleet for a new sustainable and very adaptable urban freight transport system. Its design priorities included modularity, energy efficiency, mobility dexterity, safety, automated driving and freight robotised fork handling. Specifically, the system is based on the pick-up point concept — which includes Pick&Pay, Pack Stations and Bento Boxes — providing a new solution for e-commerce deliveries. It is also a cooperative freight system that integrates the resources of the cooperating companies to obtain more cost efficiency. The project's dissemination activities focused on promoting the FURBOT vehicle and boxes into the mass market as well as the FURBOT transport system to numerous municipalities. Therefore, FURBOT fits in a radical new urban freight system. Lastly, the system also represents an opportunity to expand urban freight systems into city zones previously considered unsuitable for freight transportation.

V-FEATHER is based on the idea of designing and building urban light duty vehicles. This project was managed by industrial partners and was focused on energy efficiency, commercial viability, life cycle design with the aim to develop new technologies for LDVs lead by research institutes. The V-FEATHER vehicle architecture incorporated several innovative technologies that would be able to achieve higher energy efficiency. The main approaches and steps taken to achieve those goals included structurally integrated technologies aimed to decrease power requirements and to increase battery range thanks to weight reduction. The priority was to make the technology commercially viable and available to other OEM producers.

4.2 ICT for planning, coordinating, controlling logistics

CITYLOG aimed to increase sustainability and efficiency of urban delivery of goods thanks to integrated mission management and innovative vehicle solutions. CITYLOG project developed new urban transport technologies to improve delivery services, reduce traffic and lower cities pollution. 'Sustainability and efficiency of city logistics' CITYLOG project has improved sustainability and efficiency of urban delivery of goods. Logistics-oriented telematics services were investigated to strongly improve mission-planning processes through optimised routing and driver-support systems. CITYLOG also developed vehicle technologies to increase the operational flexibility of lorries and vans. In the second part of the project, CITYLOG solutions were deployed in three test sites and the results were analysed regarding environmental impacts as well as from a business perspective. CITYLOG solutions and technologies have had positive impacts thanks to their higher energy efficiency and better quality of services. Therefore, citizens have been benefited from less traffic on the roads, more efficient delivery services and a cleaner urban environment.

FIDEUS aimed to provide a complementary set of vehicle solutions to support an innovative approach to the organisation of urban freight transport. Meantime, FIDEUS has taken in account political strategies to

safeguard the 'liveability' of cities, while being compatible with efficient logistics. FIDEUS has contributed in a practical way to the economic livelihood of business and retail activities located in the city with policies in favour of sustainable mobility. The aim was to make available appropriate vehicles to ensure the efficiency of urban delivery operations to obtain necessary information and tools to be able to define and manage freight mobility policies. The project 'Freight innovative delivery in European urban space' (FIDEUS) proposed new technologies and management solutions to better organise the freight urban transport focused on three different axes. The integrated approach was expected to reduce the environmental impact and to decrease noise level promoting ergonomics and safety. The new 'cooperative transport' approach was characterised by the flow of goods from larger vehicles to micro carriers. It addressed customers from large-chain supermarkets to parcel deliveries, offering novel solutions that can be of great benefit to cities while reducing pollution and streamlining delivery.

INSTANT MOBILITY managed real time planning and coordination for small and mid-sized delivery trucks in cities. The Instant Mobility project has created a concept for a virtual "Transport and Mobility Internet", such as platform for information and services able to support new types of connected applications for scenarios focused on stakeholder groups. The project defined requirements for Future Internet technology tools and enablers, so that all these services could have been available to any Internet-connected user, whether using a portable, vehicle-based or fixed terminal. These requirements considered a set of technical specifications for both domain specific and FI enablers that were created as software's conceptual prototypes for a virtual demonstration. The project developed a plan for the Phase 2 to implement limited-scale trials in several real cities, using a Transport and Mobility Internet platform. Instant Mobility also analysed the non-technical framework conditions that may support or hinder eventual deployment of FI-enabled online services in the T&M domain. The project research results have supported standardisation, for FI standards in the T&M domain.

MOSCA developed a tool for integrated planning and control of production and transportation processes supporting sustainable development. MOSCA aimed at decreasing several problems affecting freight distribution in European metropolitan areas. The project provided increasing convergence of information and communications technologies integrated in a single platform. The main project outcome was a validated prototype for demand services integrating supply-oriented traffic and transport model with user-oriented DSS. The aim of MOSCA project was to improve freight distribution in European towns and cities by dealing with problems such as booking and reservation procedures, vehicle routing, loading and unloading. The consortium developed software tools that enabled transport operators to improve the efficiency of their door-to-door delivery services. Project partners adopted a collaborative approach to solve the problem of urban freight distribution, providing both demand and supply side information in a single system. Components of the supply system included dynamic road network models to predict arrival times. On the demand side, it was formed by companies that produce and transport the goods. State-of-the-art technology was used by MOSCA project to help meet customers' needs while the wider community have benefited from putting an end to traffic-clogged streets. The result was a better place to live with less air pollution and a quieter, safer urban environment, thereby improving the citizen's quality of life.

4.3 Governance and networks

CITY FREIGHT proposed a comparison of innovations in freight transport in Europe. The project considered not only new logistic technologies and their internal efficiency but also some other measures to discourage some types of goods vehicles to enter to the city centre as well as to influence positively the freight transport

demand patterns. Cities of seven countries have collaborated in building realistic deployment scenarios to achieve CITY FREIGHT's goals.

CITYLAB developed knowledge and solutions to create free city logistics in urban centres by 2030. The project focused on four pillars of action and their impact related to the topic MG-5.2 objectives. CITYLAB improved basic knowledge regarding freight distribution and service trips in urban areas thanks to a platform aimed to replicate and spread 7 innovative solutions. The concept of Living Labs, compared to conventional demonstrations, created an empiric environment in which stakeholders (such as citizens, governments, industry and research) wanted to achieve a shared long-term goal. The outputs from the living labs included best practice guidance and how to replicate them in relation to the knowledge and solutions generated to increase efficiency and load factors of freight transport in urban areas and to reduce the negative impacts of freight activities. The collaborative environment achieved from planning, improving and evaluating the real-life implementations were a major leap forward from the traditional city logistics initiatives. In conclusion, the Living Lab approach focused more on the city environment to demonstrate the feasibility of a short-term test pilot.

VitalNodes built a lasting European network of key stakeholders to increase and to apply a proven approach for the optimisation of economic, social and environmental liveability of urban areas considering multimodal transport infrastructure. VitalNodes delivered evidence-based recommendations for more cost efficient and sustainable integration of all 88 urban nodes in the TEN-T network corridors. The project presented five alternatives for a possible structure of a lasting Vital Nodes network, from little (ad-hoc) coordination between the members as well as a full controlled independent network with a management board, secretariat, etc. The objective was to integrate urban nodes in the TEN-T network. It can be concluded that for further deploying and extending the Vital Nodes knowledge and network, there was the necessity to extend the overlapping area between urban mobility and TEN-T, thereby to consider the wider policy setting in and enhancing further integration. The project has produced validated recommendations that can be linked to five different clusters: Strategy and value, network and space, governance and time, finance and funding, research and data. Summarizing, 25 concrete validations have been made including target groups who can act at the recommendation.

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5 Implementation cases

For BOOSTLOG, the ***Implementation Cases*** are concrete examples in which causal links between public R&I funding and technology, organizational or process innovation in a specific logistics area can be established. Therefore, Implementation Cases are outcomes where research results have been further developed and have been deployed as commercial solutions, have generated a new market or have contributed to new policies.

The Implementation cases and European R&I projects selected in the urban logistics domain will focus on their positive impacts and improvement in local policy development. Urban logistics is enabled by both technologies and policies/measures.

Urban logistics has been addressed in many EU R&I projects, in which a range of impactful solutions have been pioneered, stemming into changes in paradigms and business models.

Urban environment is very complex, and effects of full implementation of policies and measures can take very long time. However, we will include in the assessment some forerunner projects that have started up dialogues among stakeholders and acted as enablers for introduction of disruptive innovations, even though full implementations have not yet accomplished.

BOOSTLOG has identified **8 Implementation cases** that significantly impacted urban logistics. As shown in the table below, these implementation cases can be grouped in four clusters reflecting, where significant and relevant, the impact areas identified by the POLIS-ALICE joint document on Urban Logistics:

- **Co-creation with key stakeholder** – this cluster includes co-creation labs focused on urban freight have proven to be effective. These involve different city departments and freight quality partnerships i.e. permanent working groups involving all stakeholders groups and companies to discuss the main issues related to urban freight distribution.
- **Smart Governance and Regulations** – this cluster includes policy initiatives aimed at reducing the externalities related to urban logistics through the adoption of Sustainable Urban logistics Plans (SULPs) and emission reduction targets and related measures incentivising the transition.
- **Logistic operations** – this cluster includes initiatives aimed at optimising urban logistics through freight flows consolidation strategies, consolidation centres/hubs & micro-hubs, fleet management.
- **Clean and alternative fleet and energy** – this cluster includes initiatives aimed at decarbonising urban logistics through the adoption of new business models, acceleration of product/vehicle development, large scale deployment of energy storage and e-charging infrastructure for the adoption of clean and alternative vehicles for urban freight.

Urban logisticsCluster	Implementation case identified in URBAN LOGISTICScloud report
Co-creation with key stakeholder	• Rome Logistics Living Lab
Smart Governance and Regulations	• SULP topic guide
Logistic operations	• Padova Cityporto, • VISEVA-W – PTV • Emilia Romagna Permit Portal

Clean and alternative fleet and energy	• Declaration of Intent: Call for zero emission freight vehicles • SEUL

All implementation cases are described focusing on a short summary, its pathway from the project stage to its implementation and, where available, its potential for growth and replication.

5.1 Rome Logistics Living Lab (CITYLAB – H2020)

The main objective of the CITYLAB project (2015-2018) was to develop knowledge and solutions that result in roll-out, up-scaling and further implementation of cost-effective strategies, measures and tools for emission-free city logistics in urban centres by 2030. The core of CITYLAB is establishing a set of living laboratories, where cities work as contexts for innovation and implementation processes for public and private measures contributing to increased efficiency and sustainable urban logistics. It is important to underline that, some of the Living labs established in the project CITYLAB are still ongoing (Oslo, Rotterdam, Rome), after the project ending.

In this BOOSTLOG Cloud report the focus will be on the Living Lab established in the city of Rome.

CITYLAB has developed a methodology and a conceptual framework to set up local City Logistics Living Labs. The methodology is based on concrete case studies, that the seven partner cities have implemented over three years and in which local stakeholders have been involved. In the case of Rome, the case study promoted the co-design and co-creation of an innovative circular recycling system that integrated direct and reverse logistic flows in the university area. The pilot's lessons learned were used on the one hand to define the *City Logistics Living Lab Handbook*, which draw upon the practical experiences of the cities involved, on the other hand to guide the activities of the **Logistics Living Lab** (LLL)[32] of the city of Rome.

The LLL of Rome was established permanently in the wake of the CITYLAB project. This was formalized in 2019 through an administrative act by the Deputy Mayor for Transport, describing the LLL elements and its functioning. The LLL is a participatory co-creation laboratory that aims to systematically involve public and private actors of city logistics in Rome to carry out innovative and shared projects, in order to support the implementation of the freight-related measures included in the Sustainable Urban Mobility Plan of Rome. The LLL is owned by the Municipality, supported by the mobility agency (RSM), and managed by TRElab (University of Roma Tre).

In this framework, the stakeholders are actively engaged and motivated in testing and implementing innovative solutions and new business models, creating the best conditions for a successful deployment of the measures included in the SUMP (Sustainable Urban Mobility Plan). In the LLL, all stakeholders contribute to achieve an organic and integrated policy framework for the city's logistics, also in sustainable planning for the Rome Metropolitan area. Among LLL participants: Municipality and Province of Rome, Lazio Region, ATAC (PT Operator), AICAI (Italian Association of international carriers), Confcommercio (National Association of Trade Enterprises), Amazon (logistics service provider), and Poste Italiane (postal company), the main couriers and logistics companies such as UPS, DPD Group, DHL, FedEx / TNT, GLS, FERCAM, FM Logistic, Spedire Roma, as well as cargo bikes couriers (CORRO, etc.) and manufacturers (Piaggio).

Several stakeholders have requested the LLL to support the launch and the roll-out of experimental projects for the optimization of the urban distribution of the last mile. In 2021, TRElab and RSM have therefore

[32] http://www.trelab.it/living-lab/ ;

launched a *Call for Ideas*, to select relevant pilots. The projects range from recharging services for electric commercial vehicles, to systems for the collection of packaging with reverse logistics services, from hubs in the spaces of local markets to value-added services for riders. With the increase in e-commerce and the consequent fragmentation of deliveries, operators consider it essential to test and implement new delivery methods and business and operational models to make distribution more sustainable and optimized, also with the use of vehicles at zero emissions and cargo bikes. Some of the proposals have been embedded in ongoing projects or under preparation.

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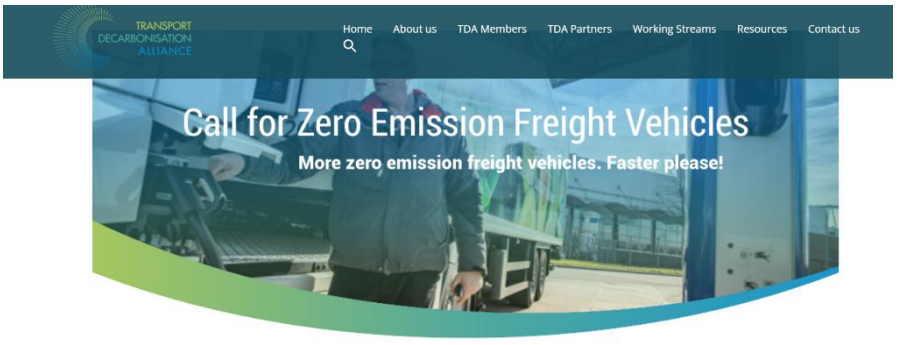
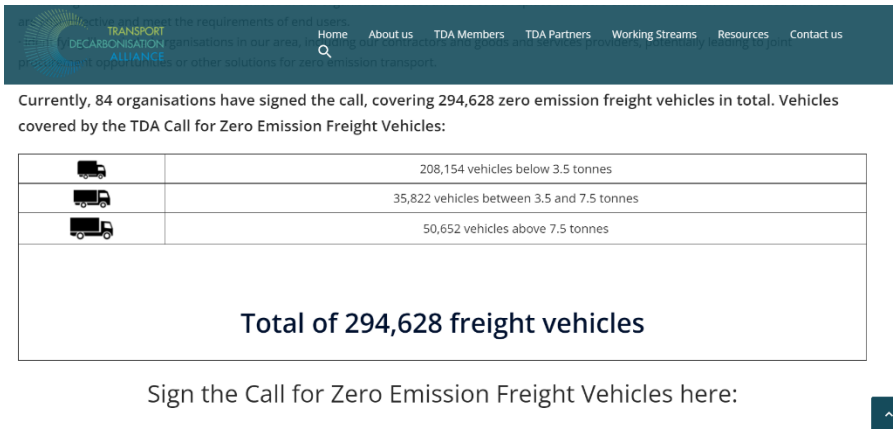
5.2 Declaration of Intent: Call for zero emission freight vehicles (FREVUE – FP7)

The main objective of FREVUE was to prove that the current generation of large electric vans and trucks can offer a viable alternative to diesel vehicles - particularly when combined with state of the art urban logistics applications, innovative logistics management software, and with well designed local policy. More specifically, FREVUE highlighted the technical and operational suitability of furlly electric freight vehicles.

FREVUE results highlight the technical and operational suitability of fully electric freight vehicles and also their limited availability and high prices.

After the FREVUE Electric Urban Logistics[33] project was finished, this demand signal was further strengthened in 2019 by the collective effort of the "Call for Zero Emission Freight Vehicles". 84 organizations signed the call, covering 294,628 zero emission freight vehicles in total. (208,154 vehicles below 3.5 tonnes; 35,822 vehicles between 3.5 and 7.5 tonnes; 50,652 vehicles above 7.5 tonnes). It was initiated by the Transport Decarbonisation Alliance and supported by the Polis Network, Climate Group's EV100 initiative and CALSTART.





The high number of vans and trucks represented by the signatories raised an meaningful indication on the actual demand to vehicle suppliers.

The aggregated demand signal later led to a series of events and the spearhead Global Memorandum of Understanding on zero-emission medium and heavy duty trucks, launched at COP26. Where 15 countries commit to 30% of new sales to be zero-emission by 2030 and a 100% before 2040. On the side of logistics operators Climate Group EV100 is currently working on a collective purchasing and/or contracting commitment in line with the MOU goals.

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[33] https://frevue.eu/declaration-of-intent/

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5.3 SEUL- Smart Electric Urban Logistics[34] project (FREVUE – FP7)

Building upon the FREVUE project results demonstrating that electric vans and trucks can offer a viable alternative to diesel vehicles, some of the consortium partners participated in further projects aimed at supporting the wider transition to electric vehicles for larger commercial fleets.

In the SEUL initiative UPS partnered with UK Power Networks Services (UK Power Networks Distribution Network Operator was the partner to FREVUE) and Cross River Partnership (coordinator of FREVUE project) and gained support from the UK government through Innovate UK to:

- Extend the number of electric freight vehicles at their central London depot by 20 Electric Freight Vehicles, bringing the number above the maximum that can theoretically be charged at any one time.
- Design and implement an innovative smart charging system at this depot together with an energy storage system.
- Design and implement a sophisticated network capacity assessment tool developed by UK Power Networks to take into account time of day variation in demand
- Develop a roadmap for how all of UPS's 170 central London vehicles could be electric
- Deliver a scalable set of outputs, which other logistics and freight operators can implement.

More Electric Vehicles (EVs) on the street, improving air quality and proving that electric really works

At the start of the project, global logistics operator UPS had already integrated 52 plugin electric trucks in its 170-vehicle fleet operating from its central London depot. However, existing electricity grid infrastructure constraints limited its ability to introduce more without a costly and disruptive grid infrastructure upgrade.

Through the project, UPS has demonstrated that it can electrify its entire central London fleet without the need to further upgrade the local electricity grid infrastructure, through a combination of smart charging and onsite energy storage. 20 mid-life UPS P80 7.5 tonne diesel urban distribution trucks were converted to fully electric models, taking the total number of EVs above the threshold number that could be charged at the depot previously.

Their successful deployment has demonstrated that EVs remain the technology of choice for urban last-mile logistics. The converted vehicles retain the capacity and distinctive features of the UPS urban distribution truck, with reduced local emissions and noise, alongside lower running costs and avoiding emissions-based charges in London. The converted vehicles have already delivered significant air quality and greenhouse gas emission savings since deployment, with an estimated 74 tonnes of CO_2e saved in the first year of deployment on a well-to-wheel basis[1].

By assessing the depot and gaining a further understanding of the vehicle charging requirements, a methodology for providing the infrastructure for EV deployment at this and other depots has been developed, using a combination of grid infrastructure upgrades, smart charging and onsite energy storage

The system developed adopts an 'intelligent' approach to charging. It spreads charging throughout the night so that the building can use the power it needs to run the business of logistics (lights, sortation machinery and IT), while also ensuring that all EVs are fully charged by the time they are needed in the morning, all while never exceeding the maximum power available from the grid.

The successfully commissioned smart charging system will now allow UPS to electrify and charge its entire central London fleet of 170 vehicles without further costly and disruptive physical grid reinforcements. The 20 project vehicles are already contributing to cleaner air, achieving estimated well-to-wheel CO2e emissions savings of 65% compared to diesel.

The system comprises of an Active Network Management system coupled with an Energy Storage System (ESS) that has the capability of dynamically controlling the local demand and was the first of its kind applied in a Business-as-Usual environment.

[34] https://crossriverpartnership.org/projects/smart-electric-urban-logistics/

In September 2020 SEUL won[35] two Global Good Awards 2020, the first one recognising technology products that have generated a positive impact for the environment or community and helped to improve quality of life for people or the planet a local level; the second recognising the three most innovative entries from across all categories in the 2020 awards programme.

More recently, SEUL has given rise to a successor initiative EFLES (EV fleet-centred local energy systems), with UPS again partnering with UK Power Network Services and Cross River Partnership, but this time adding the energy software specialist Moixa. A vital dimension of understanding EFLES is the continuity among the different initiatives. The scope of the EFLES project was built based on the findings of the previous two projects and it constitutes another innovation project supported by Innovate UK. Where SEUL concentrated on reducing or eliminating the need for costly and disruptive network upgrades, EFLES is focused on unlocking the value of optimising the timing of the purchase of energy. Through the EFLES project, UPS can maximise the use of the existing electrical infrastructure developed through the SEUL project and optimise on-site operations.

The lessons and understanding gained from all these projects are directly transferable to other sites across the UK and around the world. They support a wider roll-out strategy for electric vehicles globally.

The development of effective charging infrastructure is part of a larger global effort by UPS to scale up the electrification of its fleet.

Central to this effort is UPS's investment in UK-based Arrival – a developer of electric vehicles. UPS have committed to purchasing some 10,000 of these vehicles for deployment in Europe and North America. In addition to collaborating with Arrival to develop electric vehicles and advanced driver-assistance systems, UPS is also a strategic investor in the company – having a taken a minority stake as a demonstration of long-term commitment to the strategy.

Since its inception in 2000, UPS's alternative fuel fleet has driven more than 1 billion miles (1.6 billion kilometres) globally. This has saved more than 60 million gallons (227 million litres) of conventional fuel and now constitutes a 'Rolling Laboratory' of more than 13,000 vehicles, or a little over 10% of the global fleet.

Additionally, UPS is successfully combining human and electric power by deploying cycles (conventional and electrically assisted) in cities across Europe. These devices are ideal for navigating dense, highly trafficked areas and deliver from container depots, which are placed at pre-agreed locations in the middle of the delivery area in the city. As such, they replace delivery trucks, reduce congestion and carbon emissions, and can even operate in pedestrianised and dual-use zones.

More than 30 e-cycle projects of different sizes have now been implemented across Europe, including sites in Dublin, Paris, Copenhagen and Stockholm, Amsterdam and Rotterdam, as well as in multiple cities across Germany like Heidelberg, Mannheim and Hamburg.

With many large cities in Europe and around the world beginning to limit access to their central commercial and residential zones, where only zero-emission or compact sized vehicles are allowed, developing and deploying these concepts and technologies helps UPS to be prepared to best serve the communities in which it operates.

[35] https://crossriverpartnership.org/news/seul-wins-big-at-the-global-good-awards-2020/

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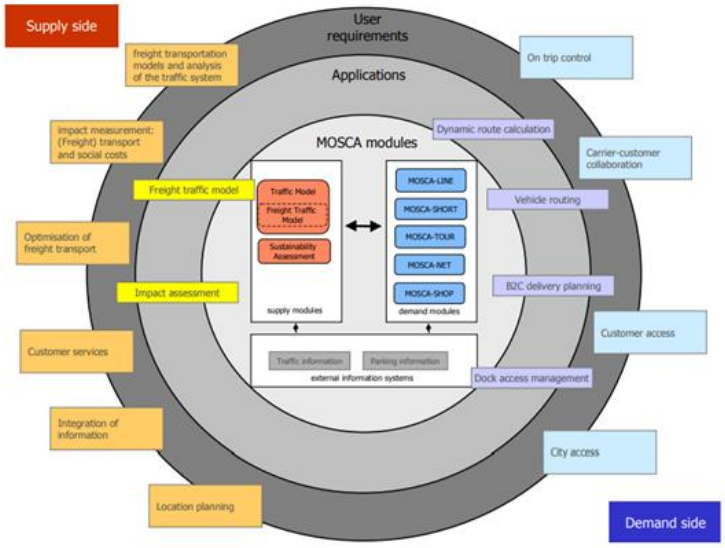
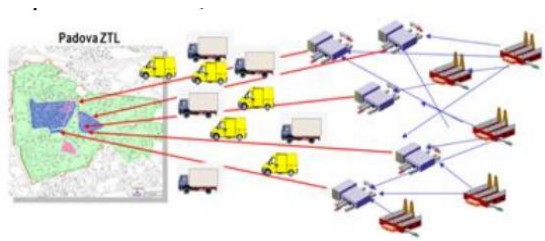
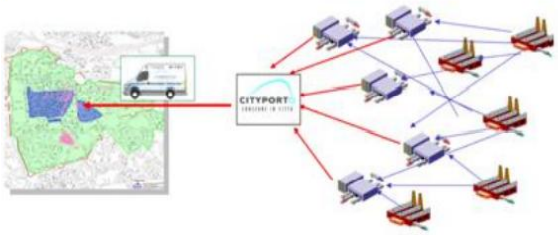
5.4 Padova Cityporto (MOSCA – FP5)

The MOSCA project provided a set of tools for improving the efficiency of door-to-door transport of goods in urban areas by collaboratively providing demand and supply-side information in one single environment/system. Five modules were developed as solutions to answer some peculiar urban freight problems and needs of the cities' administrations and logistics and transport operators. Based on extensive research on urgent user needs, a set of advanced applications were designed. For these applications suitable modules have been identified and developed. The figure below provides a short summary of how the user requirements (external circle) impact the applications (middle circle), which were in turn mapped into the MOSCA modules (Inner circle). The MOSCA system moduls communicate with each other and further external systems. One of the modurban logisticse developed by MOSCA project is MOSCA TOUR, an algorithm to plan delivery tours for a vehicle fleet if variable traffic conditions are given. It is embedded into logistics application software, which must invoke it providing data of the orders to be serviced, the objective function, and the characteristics of the vehicles' fleet.



The Interporto Padova (Padova Freight Village), partner of the MOSCA project, tested the MOSCA TOUR modurban logisticse. As preliminary activity of the test implementation, distance and travel matrices over a set of time, order data (from operators) and fleet data (from carriers in term of fleet composition and vehicle type) have been defined to generate an efficient set of routes for the distribution activities.





This allowed Interporto di Padova to quantify the distribution flows of vehicles accessing the LTZ from the freight village, contributing to the decision of Padua Freight Village to create an urban goods distribution service, Padova Cityporto, launched in April 2004 (one year after the end of the MOSCA project), thanks to the enstablishment of a Protocol Agreement between the Municipality, the Chamber of Commerce of Padova, the local Transport Companyi and Interporto di Padova.

Today Cityporto[36] is an Urban Consolidation Centre (UCC) service operational in Padua, Northern Italy, focusing on deliveries to the central area 'Low Traffic Zone' of 830,000 m^2 The deliveries are performed by 11 LNG-powered vans. The depot is a 1000 m2 wide urban consolidation platform located within the freight village. Cityporto is one of the few successfurban logisticsexperiences of this type in Italy. The model is taken as an example by many other Italian cities and is studied every year by numerous foreign delegations.

Success factors are[37]:

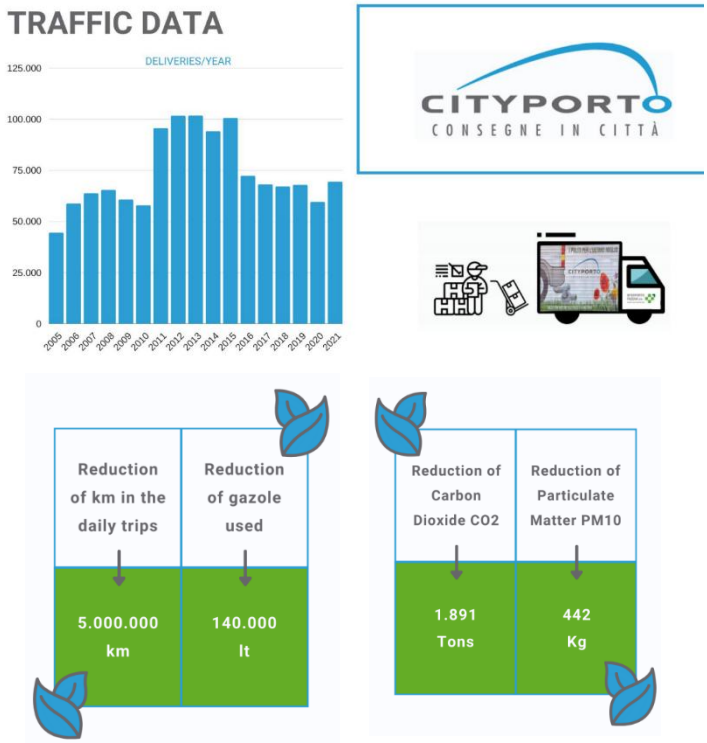
- Stakeholders involvement and full support of Municipality
- Industrial plan focused on economic sustainability
- Voluntary subscription of the operators to the service
- Location of a freight village close to the urban area
- Gradual steps of implementation of the activities

The urban distribution service has proven feasible and financially self-sustainable after a medium-long period (8 years since its implementation), proving considerable and measurable positive effects on traffic congestion and pollution.

Since 2005 to 2019 Interporto performed 1,120,000 deliveries, ensuring a tangible improvement of the urban environment by reducing traffic and pollution.

CityPorto had the merit of drawing attention to the importance of collaboration between private and public stakeholders, establishing the rigth dialogue and alignement of challenges in the city. Such strategic coperation was, for the first time in the sector and in Padova, supported by technological solutions, contributing to new curban logisticsture on data sharing from different operators .

The project has also shown that, in most cases, the success of concrete distribution logistics projects is based on inexperience and logistical, not technological, difficurban logisticsties.



[36] https://www.interportopd.it/cityporto/

[37] https://www.interportopd.it/files/Presentazioni/Cityporto_Padova_EN_2022.pdf

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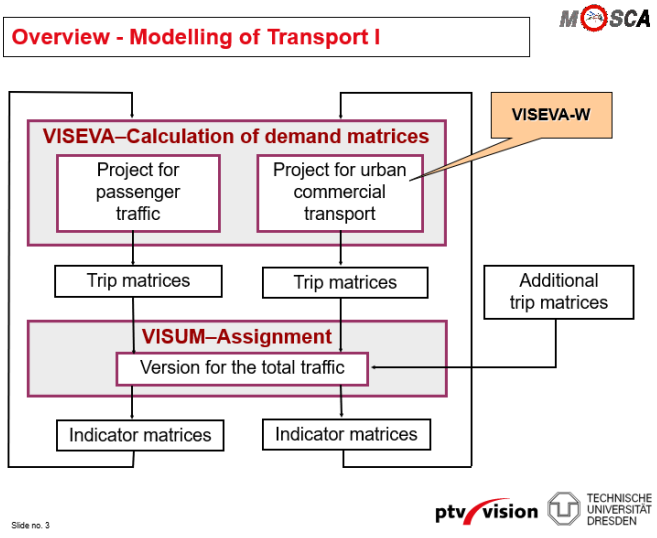
5.5 VISEVA-W - PTV (MOSCA – FP5)

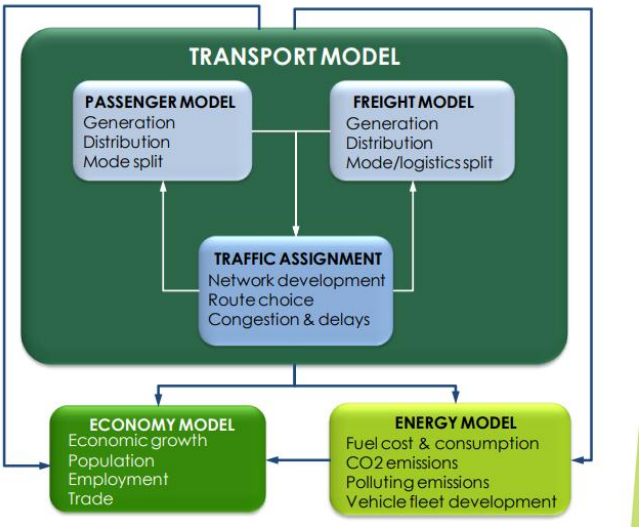
The MOSCA project provided a set of tools for improving the efficiency of door-to-door transport of goods in urban areas by collaboratively providing demand and supply-side information in one single environment/system. Five modules were developed as solutions to answer some peculiar urban freight problems and needs of the cities' administrations and logistics and transport operators. Based on extensive research on urgent user needs, a set of advanced applications were designed. For these applications suitable modules have been identified and developed. The figure below provides a short summary of how the user requirements (external circle) impact the applications (middle circle), which were in turn mapped into the MOSCA modules (Inner circle). The MOSCA system moduls communicate with each other and further external systems. It's important to highlight that MOSCA aimed at exploiting project outputs supporting applications in existing and newly developed information systems. The information system development was market-led from the very beginning involving both transport operators and relevant service providers in extricating their needs.



One of the modul developed by MOSCA project is MOSCA FREIGHT (VISEVA-W). VISEVA-W integrates freight transport data into urban transport models, allowing modelling urban freight traffic and it was tested in Chemnitz.

Main results achieved are:

- demand model for urban freight transport is possible and useful
- The effort for data collection/mining depends on the availability of behavioural data and the definition of freight traffic classes (VISEVA supports individual definitions of freight traffic classes)
- The software is a pioneer in integrated management of freight and passengers transport modelling.
- The assignment on the network delivers traffic flows for a range of different freight and passengers transport vehicle types
- deep analyses of freight transport in connection with the passenger transport is possible, to support city traffic management



After the project, the methodology of modules integration defined in MOSCA was further developed and applied in the Trimode[38] project. In particular, in Trimode the transport network model (simulating both passenger and transport activity) integrates energy and economy components to be

[38] http://www.trt.it/wp/wp-content/uploads/2018/05/1-TRIMODE_Leaflet_2018.pdf

used by the European Commission for the assessment of major transport infrastructure projects as well as of a wide range of transport policies.

The MOSCA-FREIGHT module flowed into new product developments to complement the freight related part of urban transport planning and optimisation from the public side, but also to improve the planning tools for the private side. VISEVA-W is now integrated into the overall model structure of the VISEVA model for passenger transport demand and the VISUM model for traffic assignment, helping transport planners in conducting traffic analyses for cities and optimising the overall transport system..

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5.6 Emilia Romagna Region permit portal (NOVELOG – H2020)

In the framework of the NOVELOG Project, the pilot carried out in the Region of Emilia Romagna had the objective to simplify and harmonise the administrative rules for city logistics at regional level in relation to the management of the permissions of freight vehicles to access the urban LTZs.

The cities involved were the largest ones participating to the Air Quality Programme Agreement, namely Bologna, Piacenza, Ferrara, Parma, Rimini, Faenza, Forlì, Cesena, Ravenna, Reggio-Emilia and Rimini.

Following the harmonization process, already promoted by the Emilia Romagna Region since 2013, some rules have been unified (e.g. access time windows for vehicles over 3.5 tons) and the criteria for issuing permits for logistics operators needing to access LTZs have been partially standardized.

Nevertheless, there are still differences between the various Municipalities regarding the management of the administrative procedure. Administrative procedures to get the permission are indeed completely different from city to city. Therefore, moving from one city to another, logistics operators have to comply with different rules, which generates economic and operational inefficiencies.

	Imola	Faenza	Bologna	Reggio Emilia	Parma
Vehciel registration certificate	• Desk release • Digital delivery	• Desk release • Digital delivery	• Self certificate • Desk release	• Desk release • Digital delivery	• Desk release
Vehicle ownership	• Not requested	• Desk release • Digital delivery	• Self certificate • Desk release	• Self certificate	• Desk release
Vehickle data	• Acquired by external database • Desk release • Digital delivery	• Desk release • Digital delivery	• Self certificate • Desk release	• Desk release • Digital delivery	• Desk release
Compamy data	• Desk release • Digital delivery	• Desk release • Digital delivery	• Self certificate • Desk release	• Self certificate • Desk release • Digital delivery	• Desk release
Company invoices	• Desk release • Digital delivery	• Self certificate	• Self certificate • Desk release	• Desk release • Digital delivery	• Desk release
Other			• ID card	•	

Looking to a progressive harmonization and a single one-stop-shop on a regional basis, the following aspects were identified on which it was decided to work to achieve complete uniformity in all municipalities:

- **Data acquisition from external databases and self-certification**: users are asked to produce documentation certifying the possession of certain requisites, sometimes the documentation is redundant and not digitalized and this produces inefficiencies and recording errors. It is advisable to work towards the acquisition of documents from external databases (Nation public vehicle registry, Chambers of Commerce for company data) and when this is not possible (e.g. invoices attesting activity in LTZ) request self-certification, to reduce the problems mentioned above and enable software integration among different platforms, relieving databases that often present non-technological but legal problems (data processing between different bodies).
- **Dematerialization**: some municipalities allow the electronic transmission of documents and release the permit in dematerialized form (the permit does not consist of any physical support, but is an authorization linked to the user / vehicle). To complete this process technological upgrades are sometimes necessary (in particular on parking enforcement) but on the other hand benefits can be obtained, both for the public administration and for the citizens, in terms of reduced access to the counter.
- **Online payment**: this process, often consequent to dematerialization, makes possible to complete the release procedure in a completely remote form, thus further reducing costs for both citizens and the public administration

To this end, a prototype IT tool has been developed to manage the LTZ's access systems for all cities in order to ease the process for logistics operators. This tool is able to:

- Verify permit requirements: against number plate entry, with associated costs and access/parking fees;
- Verify active permits (per vehicle, with associated expiry dates and access rights);
- Apply for new permit or Change/Renew active permit

This portal prototype is now going to be activated from the Region which, at the end of November 2020, approved a Memorandum of Understanding between the Region itself and the municipalities that have expressed interest in the initiative and in the implementation of the project to define the timeframe and methods for the detailed design and subsequent implementation of the web portal. The funds for the realization of the portal are already committed.

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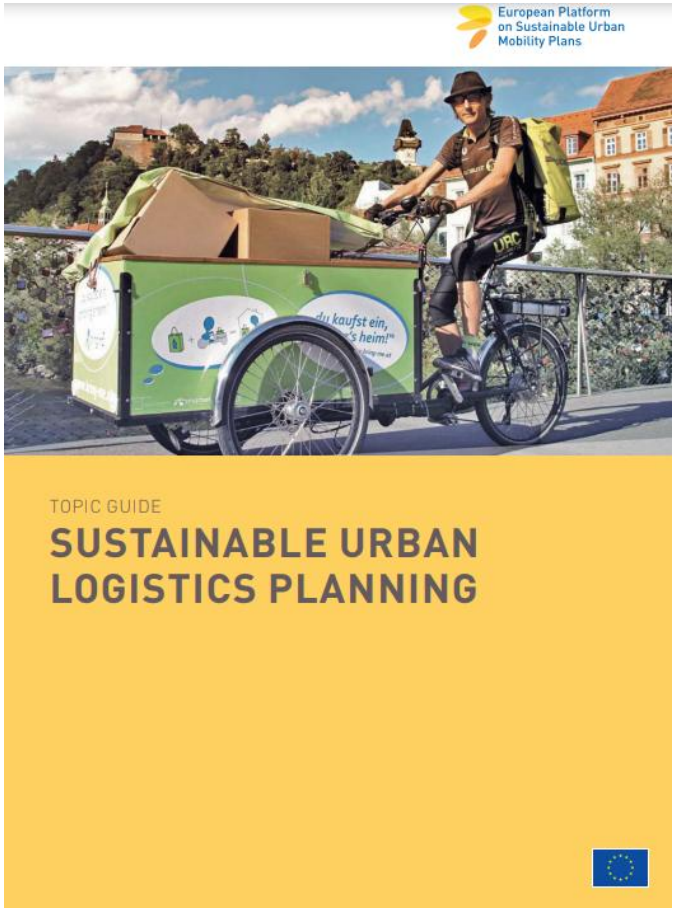
5.7 Sustainable urban logistics planning topic guide[39](NOVELOG – H2020)



The Sustainable Urban logistics Planning- SULP Topic Guide was developed in the framework of the HORIZON 2020 NOVELOG project. After three years of research & Innovation activities the project gained insights into urban freight transport (UFT) operation and provided guidance for implementing effective policies and testing collaborative & sustainable city logistics measures in twelve cities around Europe.

Building on this experience from diverse urban environments and transport & logistics industry set ups, the project developed a compendium of knowledge & tools in the form of a practical guide to support the city stakeholders (public & private) in implementing the city logistics related, planning steps of the updated SUMP cycle developed by the SUMP2.0 project. The topic guide provides practical assistance to a city on how it should address the urban logistics aspect in the city's SUMP. It gives evidence on which parts of the SUMP process a dedicated Sustainable Urban logistics Planning process is needed. The guide is rich in benchmarks & best practices, to follow (i.e. multi-stakeholders platform mixture & governance model for UFT, Examples of Public Private Partnerships for sustainable city logistics implementation, Vision definition for industry understanding and engagement, etc) while it provides to city authorities and decision makers a detailed framework of tools, methods and techniques that can be used for improving the sustainability and effectiveness of the urban mobility system taken into account the current city logistics challenges and the city's unique typology.

The document was published by ELTIS[40], the Europe's main observatory on urban mobility, financed by the European Commission's Directorate General for Mobility and Transport as part of a compendium of guides and briefings that complement the SUMP Guidelines and can be found here: https://www.eltis.org/sites/defalt/files/sustainable_urban_logistics_planning_0.pdf

The guide suggested original planning aspects which are proved valid also for the today challenges: **a)** the development of a minimum set of data for Urban Freight Planning & Assessment by applying an ecosystem neutral approach for data sharing, **b)** the opening of the geographical coverage of the plan by considering the broader supply chain typology and suggesting strong regional dimension and cooperation, **c)** the fact based and data driven approach offered by the NOVELOG toolbox for UFT understanding & planning, **d)** the planning method to swift form pilots implementations to integrated set of sustainable logistics measures.

[39] https://www.eltis.org/sites/default/files/sustainable_urban_logistics_planning_0.pdf

[40] https://www.eltis.org/in-brief/about-us

By considering the complexity & the fragmented nature of the city logistics sector, and in order to stimulate the industrial stakeholder's motivation, the Topic Guide suggest merging of some SUMP activities when developing a SULP and delivers a set of step-wised guidelines to 8 implementation steps: 1) Set up working structures, 2) Define the development process and scope of the plan, 3) Analyse the current UFT situation, 4) Develop vision and objectives with stakeholders, 5) Build & jointly assess scenarios, 6)Set targets and indicators, 7)Select measure packages with stakeholders, 8)Agree actions and responsibilities.

In each of the above implementation steps the reader may find: data collection frameworks, links to electronically available tools, checklists & milestones, examples of legal documents for Agreements and access to best practices. More than 250 UFT real cases been tested in EU funded projects such as BESTUFS I & II(2000-2002) , CITYFREIGHT (2002,2004), SMARTFREIGHT (2008-2011), SUGAR (2008-2011), SMILE (2013-2015),CO-GISTICS (2014-2016), U-TURN (2015-2018),CITY-LAB (2015-2018) NOVELOG (2015-2018) etc are available for the reader of the Topic Guide through the NOVELOG Toolkit, open-source online pool of UFT measures[41].

Almost three years after the completion of the Topic Guide the document constitutes the main guiding reference at European level for the development of SULP in several European cities proving its ability to cover the stakeholders needs. Apart of the research & the CIVITAS communities which recognised its validity and use it in many events (6th European Conference on Sustainable Urban Mobility Plans[42], National Conferences of CIVITAS projects, POLIS Conferences, VREF Conference in Gothenburg, etc.), the SULP topic guide is recognised as the reference city logistics document for the capacity building program of Interreg Europe Policy Learning Platform and it is used in various capacity building activities: Interreg Europe Workshop (Tackling the urban logistics challenge webinar [43]; Tackling the urban logistics challenge webinar; Framing the Urban logistics strategy workshop; SUMP Peer Review processes hosted by the City of Warsaw, Ireland, etc.). Finally the SULPs Guidelines are still used in ongoing EU research initiatives: 1) In H2020 Fast Track project, together with NOVELOG outcomes the Topic Guide, are used as reference in the capacity building events for innovative city logistics, 2) In the H2020 SURF project, dedicated training module was using the guide for SULP development, 3) The SULP topic guide was one of the documents communicated in the context of the EU-USA collaboration activities for city logistics (2019) and was central theme in invited speeches in relevant conferences in USA since then.

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[41] http://www.uct.imet.gr/

[42] https://www.eltis.org/sump2019

[43] https://www.interregeurope.eu/policylearning/event/4126/webinar-tackling-the-urban-freight-logistics-challenge/?no_cache=1

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6 Potential implementation paths

The projects analysed showed that the most critical issue to implement urban logistics initiatives and policies is the **lack of relevant data for urban logistics**. Currently, there are very few cities collecting data that can help define the state of the art of urban logistics practices, preventing on one hand local authorities from having evidence of the problems and externalities resulting from urban logistics, and on the other hand operators from having visibility of the progress and improvements achieved by adopting new innovative solutions for the performance of their services. The frequency of data collection also stems from this problem. Some cities, also through some European projects, collect "one-off" data relevant for urban logistics when implementing some measures or defining some policies or writing an SULP, but then the data are not collected on a regular basis. In this sense, some experts interviewed stressed the need to have a concrete plan of collection of data which is made systematically for freight.

Another critical issue is the poor involvement of the industry and the market players. Although these actors are formally involved in several R&D projects on urban logistics, the approach of these projects does not appear to be sufficiently market-oriented. This hinders the commitment of urban logistics operators who do not see their priorities reflected in the initiatives and policies adopted by local authorities. It also hinders the transferability of the best practices tested in other cities.

When looking at the implementation cases showcased in this report, one can identify one common success factor, which is the collaboration between private and public stakeholders, establishing the rigth dialogue and alignement of challenges in the city. Cases of European projects where industry priorities were identified, supported and integrated into policy making were those that generated further developments beyond the project duration. On the other hand, of course, the city must have a clear picture of the externalities arising from urban logisticsand steer , through policy making, the practices of operators towards increasingly sustainable models.

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Annex I – Implementation case template

1. Main R&I projects which have developed results/outcomes based on which you developed this implementation case
2. Main Implementation Case/product or Solution:
   - Overview and key pain point addressed/Market addressed/Users/How the implementation case impacts on EU Policies
3. How Public funded supported the Implementation Case development and in which stages?
4. How you Covered the Gap between the project Results & reaching the market?
5. Which have been the main hurdles to overcome:
   - Financing for further development
   - Finding right partners
   - Value proposition towards customers
   - Business models
   - Other
6. Which have been the key success factors to move from R&I results to an actual implementation?

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Annex II – Semi-structured interview guide

1. Project introduction

For more than two decades EU has invested in research and innovation (R&I) through various Framework Programmes, e.g. FP5 (1998-2002), FP6 (2002-2006), FP7 (2007-2013), and the ongoing HORIZON 2020 (2014 – 2020). This has contributed to the development of the logistics sector through the creation of new companies, implementation of concepts in practice and through science based regurban logisticsation. The BOOSTLOG project aims to boost impact generated from future EU funded R&I projects to contribute to EU policy objectives, address societal challenges and increase EU's competitiveness. The project will map more than 160 projects funded by FP5, FP6, FP7 and Horizon 2020, and identify successfurban logisticsimplementation cases into the market and regurban logisticsations and will develop actionable reports on various subjects prioritized by stakeholders. The project will assess the impacts generated, identify gaps and priorities for future funding programmes.

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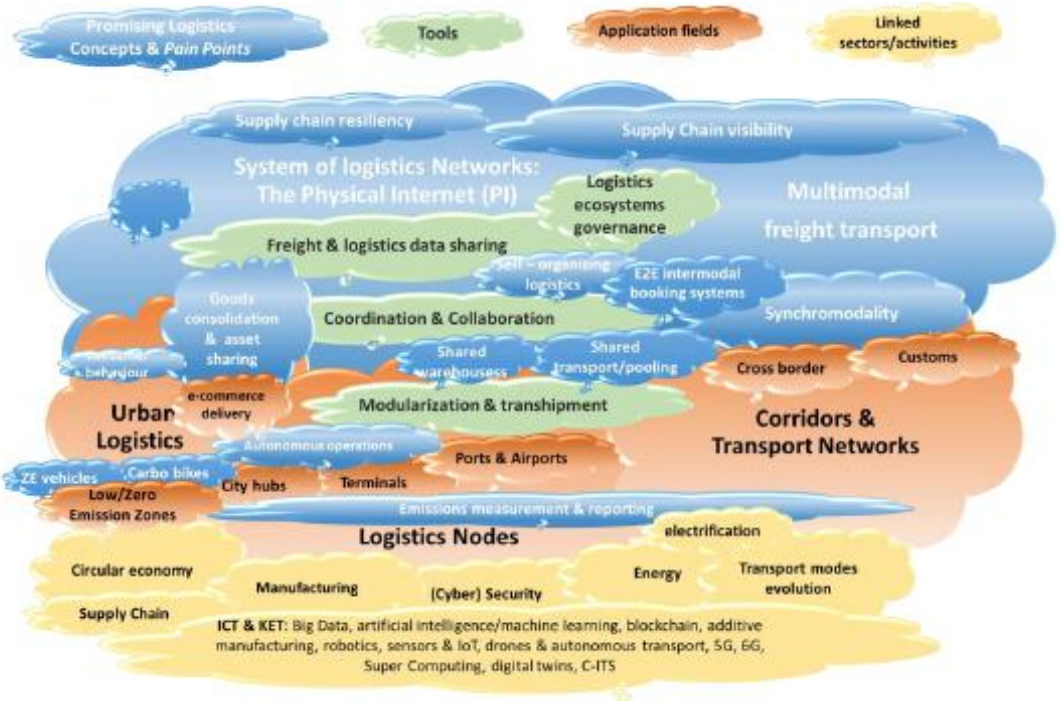
2. Cloud and subclouds diagram



- Do you miss any important cloud/subcloud?
-

3. Most relevant projects in the cloud

- Do you miss a relevant R&I project not included here?
- Do you miss an important/relevant organization with good R&I results in this area?
- If yes? Which organizations and for which results? Who is the contact person?

4. Trends and societal drivers relevant/addressed for the Cloud

LIST of trends and societal drivers:

Climate change, urbanization, individualization, digitalization, demographic change, resource scarcity, circurban logisticsar economy, driver shortage, online shopping, COVID-19

- Do you agree with this list of External Factors?
- Which are for you the 2/3 most critical/relevant?
- Which are the specific consequences to the logistics sector (e.g. online shopping means fragmentation of flows, instant deliveries/speed, last meter delivery)?

5. Relevant EU policies addressed

LIST of policies addressed by the cloud:

- **The European Green Deal**
- **Economy that Works for People**
- **Promoting our European way of life**
- **A Europe fit for the digital age**

- Which other policies you know are also relevant?
- Which is the EU policy this area has a greater impact?

6. Project participation of your organization per Cloud

- Have your organization participated in other relevant projects? Which ones? Could you share some information references?
- Which are the most Relevant/Key R&I results project deliverables for each project? Could you share them with us?
- Which have been the key partners on those projects à Generating results/outcomes and after project implementation?
- Overall, which is your conclusion on the projects in terms of:
    - Progress made
    - Level of adoption of results
    - Which have been for you the 2/3 key barriers for adoption?
    - Which would you think is the best (or best 2 projects) and why?

7. Project Outcomes

- Do you have any outcome out of these projects in this field?
- If a research center, is it your ambition to transfer/implement the Knowledge?
    - How your organization address that?
        - Through Market agreements on Knowledge Transfer to Companies.
        - Spin offs
        - Other
- What is the main barrier to reach the market you faced:
    - Financing for further development.
    - Finding right (industry) partners
    - Value proposition towards customers.
    - Business models.

  - Other?
- Do you have outcomes out of R&I projects in other BOOSTLOG CLOUDS?

8. Implementation Cases

Implementation Cases are concrete examples in which causal links between public R&I funding and technology, organizational or process innovation in a specific logistics area can be established.

Implement Cases are that research results have been further developed and have been deployed as commercial solutions, have generated a new market or have contributed to new policies and will stablish causal links between research funding and impact.

- Do you know any Implementation Cases out of these projects?
- If yes, which entity was the R&I/Outcome owner and which entity was the Innovation Seeker.
- Would you like ALICE/BOOSTLOG to promote the Implementation Case?

9. Final comments

- How could we improve the interviews?
- Would you like to join a workshop in which we will share the aggregated results and discuss conclusions with your peers?
- Any further comment.