unchain

D2.1 – Local frameworks and SUMP/SULP analysis

UK Research and Innovation

Funded by the European Union

CIVITAS Sustainable and smart mobility for all

Legal disclaimer

This document is issued within the frame and for the purpose of the UNCHAIN project. This project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101103812. The UK participant in Horizon Europe Project UNCHAIN, is supported by UKRI grant number 10078841 Lancaster University.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Copyright statement

Deliverable details

Deliverable No.	D2.1
Deliverable Type	R – Document, report
Dissemination Level	PU - Public
Work Package No.	2
Work Package Title	Requirements identification, data landscaping and use cases definition
Task No.	2.1
Task Title	Diagnosis of local framework, SUMP/SULP analysis and logistics ecosystem
Author(s)	SPES Consulting
Status (F:final; D:draft; RD:revised draft)	F
File name	D2.1 – Local frameworks and SUMP/SULP analysis
Version	0.3
Task start date and duration	01/05/2023 – 31/10/2023
Due Date	M6 (October 2023)
Delivery Date	31/10/2023

Review History of Deliverable

Version No.	Date	Revision Details
0.1	09/10/2023	Draft version
0.2	23/10/2023	Draft version
0.3	30/10/2023	Draft version

Reviewers of Deliverable

Reviewers name	Company	Date
Julius Menge & Nico Keinath	SenMVKU Berlin	13.10.2023
Jasmin Rychlik & Ishak Gougam	VMZ Betreibergesellschaft mbH	13.10.2023

Table of Contents

List of Tables

List of Figures

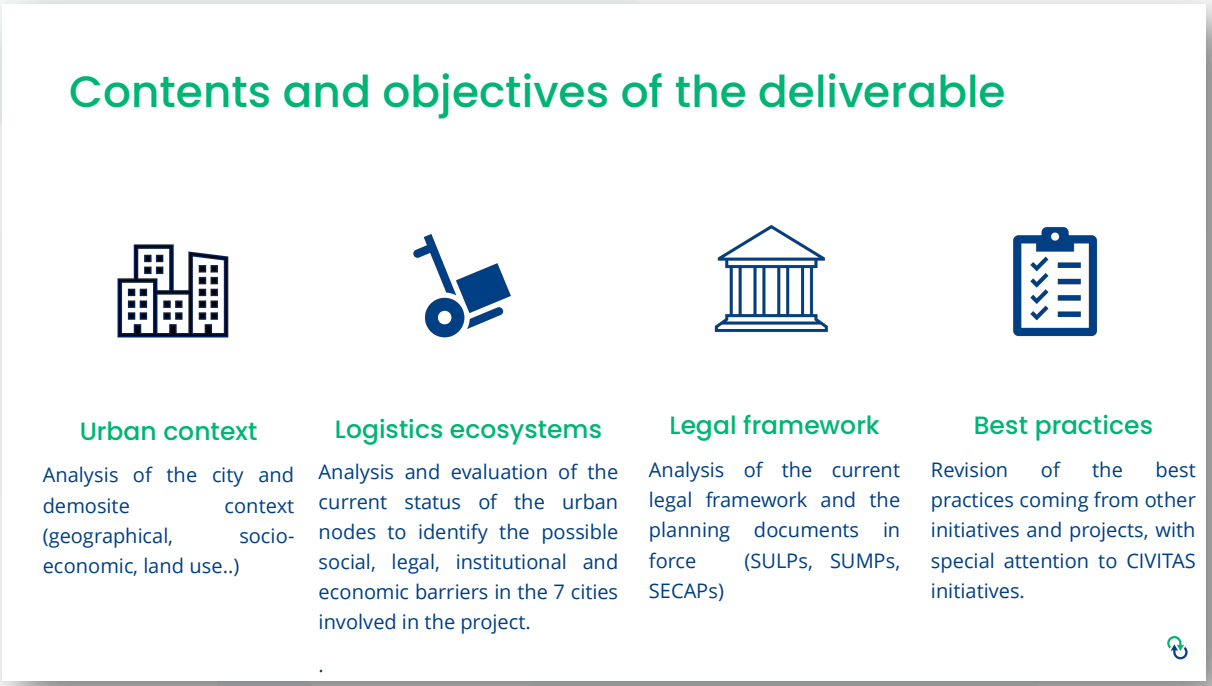
Acronyms

Acronym	Meaning
B2C	Business to Consumer
BEI	Baseline Emissions Inventory
BER	City of Berlin
BP	Best Practices
CCTV	Closed-circuit television
CoM	Covenant of Mayors
FLO	City of Florence
FMA	Florence Metropolitan Area
FUA	Functional Urban Area
FUN	City of Funchal
GDPR	General Data Protection Regulations
HORECA	Hotel, Restaurant and Catering sector
KPI	Key Performance Indicator
MAD	City of Madrid
MECH	City of Mechelen
PPP	Public-Private Partnerships
PRA	City of Prague
RIG	City of Riga
SECAP	Sustainable Energy and Climate Plan
SSCR	Smart City Control Room
SULP	Sustainable Urban Logistics Plan
SUMP	Sustainable Urban Mobility Plan
UDC	Urban Distribution Centre
UFD	Urban Freight Distribution
UC	Use Case

Executive Summary

This deliverable evaluates and diagnoses the local framework and boundary conditions of the seven cities participating in the project demonstrations identifying the possible social, legal, institutional and economic barriers for the take up and deployment of the project measures. Beside the illustration of the actual logistic ecosystems, the activity includes a complete analysis of the current legal framework and policies of the project pilot sites together with the cities' Sustainable Urban Mobility Plans (SUMPs) and Sustainable Urban Logistics Plan (SULPs), and Sustainable Energy and Climate Action Plans (SECAPs).

A first collection of best practices from CIVITAS projects has been provided and enriched by partners' know-how and experience in other programs to find possible available solutions to the identified barriers.



1 Introduction

1.1 Diagnosis of local framework, SUMP/SULP analysis and logistics ecosystem: aims and links

The work carried out in the first months of the project (May-Oct '23) and reported in this deliverable has been aimed at analysing in deep the actual local frameworks in all the partner cities to better define the context where the pilots will take place; the result will be the basis for the requirements and usage scenarios definition (Task 2.4 and Task 2.5).

The analysis of the existing plans and regulations influencing logistic sector is fundamental for a tailored design of the project solutions, for the following study of possible extension/replication or adaptation in other contexts (WP7 and WP8) and also for the update of the planning framework itself (Task 4.4 and Task 8.5) to include more and more sustainable logistic actions and extend project solutions. Moreover, the analysis of these planning tools has highlighted the monitoring approaches in use to support the project KPIs dashboard selection (Task 2.3).

A collection of best practices from CIVITAS projects has been structured and enriched by partners' know-how and experience in other programs to find possible available solutions to the identified barriers. This first data base of available solutions will be continuously updated thanks also to the cooperation with other EU initiatives (Task 8.4) and matched with upcoming needs detected by the cities also during the implementations.

The importance of understanding the local context and regulations is crucial to empower sustainable urban logistics, aligning with the overarching goals of the UNCHAIN project, which aims at empowering local authorities with data-driven tools to anticipate urban freight generation and demand and improve space management and logistics operation; the innovative solutions developed will be tested in pilot cities' demonstration urban contexts to be extended and replicated with go-to market strategy and plans.

1.2 Deliverable description and reference documents

The present deliverable reports the results of the analysis based on:

- Data collected from partner cities in the questionnaires.
- General information available in institutional websites, open data platforms and documents about demography, economy, mobility infrastructure and data availability
- Information taken from existing sustainable strategies:
  - Sustainable Urban Mobility Plans or strategies influencing the whole transport system;
  - Sustainable Urban Logistic Plans already focussed on the topic;

Funded by the European Union

- Sustainable Energy and Climate Action Plans setting climate mitigation and adaptation goals at 2030 for all sectors (buildings, mobility, urban services like waste and water management, green & nature based solutions).

In the report, after the description of the methodology adopted, the huge amount of information collected has been structured following a topic-driven index to facilitate the comparison of the different cities as follows:

- General description of the context including geographical, urban and socio- economic framework;
- Description of the urban logistic eco-systems;
- Analysis of the planning framework;
- Conclusions and first recommendations.

2 Methodology

The methodology implemented is based on the analysis of local frameworks in terms of the following influencing aspects:

- Demography
- Economy
- Infrastructures
- Policies about mobility, urban development, sustainability
- Logistic and technological solutions in place / planned

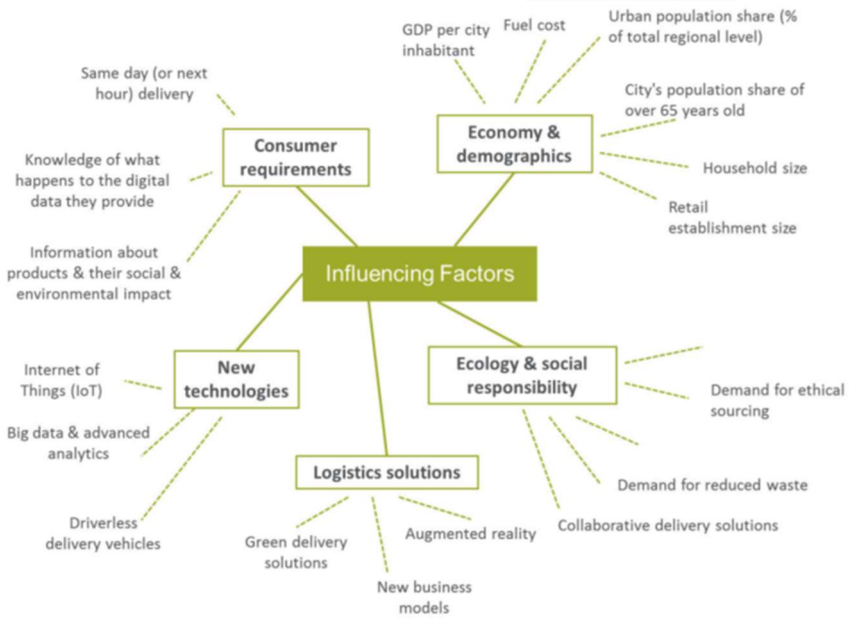


Figure 1 List of UFD influencing factors (Source: SUSTAINABLE URBAN LOGISTICS PLANNING Topic Guide)

The consumers' requirements have been included in terms of general trends, while specific analysis will be carried out at use-case level in the following tasks of the project.
The tools developed for the analysis are illustrated in the following sub-paragraphs.

2.1 Questionnaire

A first questionnaire has been provided to the partner cities to collect first data and all possible links to information sources (see annex VI).

The questions regarded:

- the general context, including socio-economic aspects and land use data;
- the urban eco-system with physical infrastructures, ICT and technological infrastructures, data availability about transport and stakeholders involved;
- the available plans, regulations and agreements in place with covered area and period, scenarios, measures, monitoring KPIs;
- direct feedback about challenges foreseen or already faced in legislation, infrastructures, data availability and management, economy, social acceptance…;
- links to any supporting document or database.

Some optional sections have been included to start collecting data about the use cases if already available.

Another questionnaire has been developed for partner logistic operators aimed at collecting data about transportation and monitoring indicators.

2.2 Collection of European best practices

A database of best practices from European projects has been developed and shared in the project common repository to be continuously updated. Best practices have been selected among the solution tested addressing one of the topics of interest of the project; those experiences bring solutions in terms of technologies, approaches and/or lesson learnt that could be helpful for the project activity.

The first section is dedicated to Civitas projects, extracted from Civitas database[1], while the second consists in a collection of all other projects from different programs (Horizon Europe, H2020, Interreg, National programs, and so on).
The information has been gathered from EU portals and partners direct know-how and experience.

[1] https://civitas.eu/projects?date=1

Thanks to the whole project consortium support, more than 100 best practices have already been included in the database and catalogued by purpose/solution keyword to facilitate the search.

During the project meeting in Florence an on-line survey has been launched to start matching the best practices to the obstacles identified by the cities.

2.3 Gender related issues

The research team working at this deliverable is the whole UNCHAIN consortium.

No gender studies have been detected in the reference documents analysed.

2.4 Ethics related issues

Not applicable.

2.5 Data related issues

Data have been provided by partners from public sources and managed by SPES.

3 Cities' General information

This section provides an overview of the socio-economic context in the seven cities involved in the project. In order to better understand and deal with the urban challenges of logistics and its impacts, information related to socio-demographic indicators, such as changes in population and its characteristics, densities and economic activities locations are necessary. In fact, cities are commonly organized around commercial, institutional, residential, manufacturing and logistics districts, which are the main generators and attractors of freight flows. Data have been collected through the questionnaires (see paragraph 2.1) and available sources reported in the notes and in the references.

3.1 Local context

Madrid (ES), at the heart of the larger metropolitan area, has a population of around 3,3 million inhabitants and covers 604 km². Its population density is 5.452 inhabitants per km². The population is distributed unevenly over the 21 city's districts, with the most densely populated areas being those located in the "central almond" and its surroundings while the outermost areas have lower population densities.

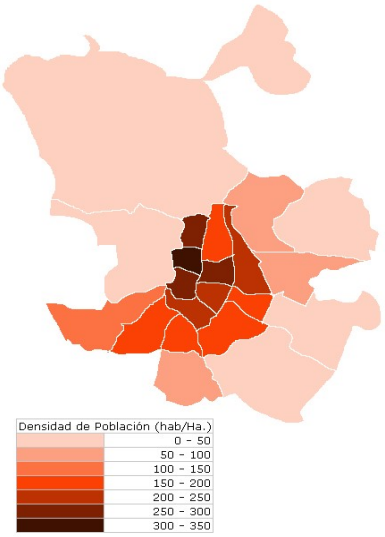


Figure 2 Population density per district in Madrid (source Anuario Estadístico Ayuntamiento de Madrid)

The population trend has registered a slight decrease after covid-19 pandemic. The city's GDP per capita is 17.059 €. Madrid, as capital of Spain, has a concentration of high-level services to businesses, high level administration services, high level research and education. Retail and accommodation activities are also an extremely important share of Madrid's economy. Specifically, 321.340 companies operate in Madrid: 26% in commerce, transport and HORECA, 12% in industry and construction, 62% in service activities (IT, finance, insurance, real estate, education, health, etc.). The logistics sector in all the regional area "Comunidad de Madrid" employs 120.000 workers.

Regarding the land use statistics, leisure area represents the 10,2% of total surface, residential area the 10,5% of total surface and the commercial & Industrial area the 6,1% of total surface. The Functional Urban Area (FUA) boundaries are estimated to match the metropolitan area of Madrid, bigger than the city of Madrid but less extensive than the regional boundaries.

The City of **Florence** (IT) has a population of around 366.000 inhabitants and covers 102 km². Its population density is 3.584 inhabitants per km². The population trend has been registering a decreasing trend since 2016.
Florence territory is divided in 5 districts and hosts a wide invaluable UNESCO world heritage centre and buffer area.

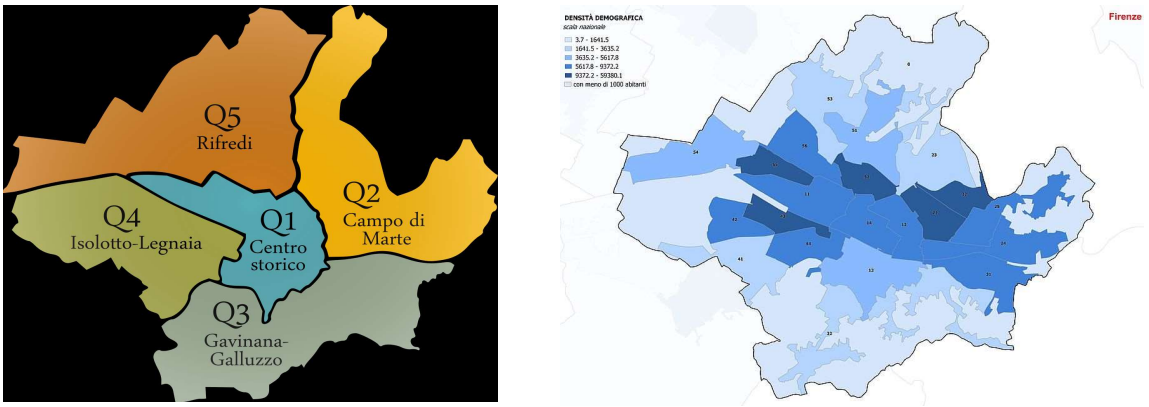


Figure 3 The Florence city districts and the population distribution across the city. (source: Florence Municipality)

The city's GDP per capita is 23.666€. Florence is the capital of the Tuscany Region and central core of the metropolitan area. The tertiary sector plays a prevalent role in the economic profile of the Florence area. In terms of labour force at provincial level, 53% of workers are employed in the service sector, the 18,4% in the HORECA sector, 27% in the industry sector and 6% in the construction sector.
Florence and the Florentine belt concentrate over 80% of those involved in logistics activities. The average number of employees per local logistics units in Florence is about 10 employees/local unit.

Analysing in detail the transport and logistics business categories, the employees and companies of the "Road freight transport" activities are located especially in Florence and in the surrounding area, with an increase trend in the number of employees in the latter registered in the latest years.
In the case of "warehousing and custody" activities, the concentration of workers and local units in Florence and in the Belt is even more marked.

Regarding the land use statistics, the context of the City of Florence differs from that of the rest of the Metropolitan City, since most of the city surface is urbanized: the 36% of the urban area is covered by the settlement system, 14% by productive surfaces, 8% by urban green areas. Agricultural areas occupy 32% of the total and wooded areas 9%.
The FUA of Florence matches the metropolitan area boundaries.

The City of **Berlin** (DE) has a population of around 3,8 million inhabitants and covers 891 km^2. Its population density is 4.176 inhabitants per km^2. The population trend is increasing and roughly 4 million inhabitants are expected by 2040. Berlin's population density varies across its 12 districts: in the inner city (area within the S-Bahn Circle Line) a density of around 11.700 inhabitants per km^2 is registered, well above average in the whole city. Alongside uninhabited areas such as forests and agricultural areas, there are also relatively sparsely populated settlement areas with 5 to 70 inhabitants per hectare on the outskirts of the city. These areas belong to the urban structure type "Low buildings with yards". They extend along the city boundary like a ribbon. The large estates Marzahn and Hellersdorf on the eastern outskirts of the city form an exception.

Besides the residentials, more than 200.000 students have chosen the internationally renowned science location Berlin and the number of people in work and economic output are increasing rapidly. Berlin's foreign trade is also showing continuous growth.

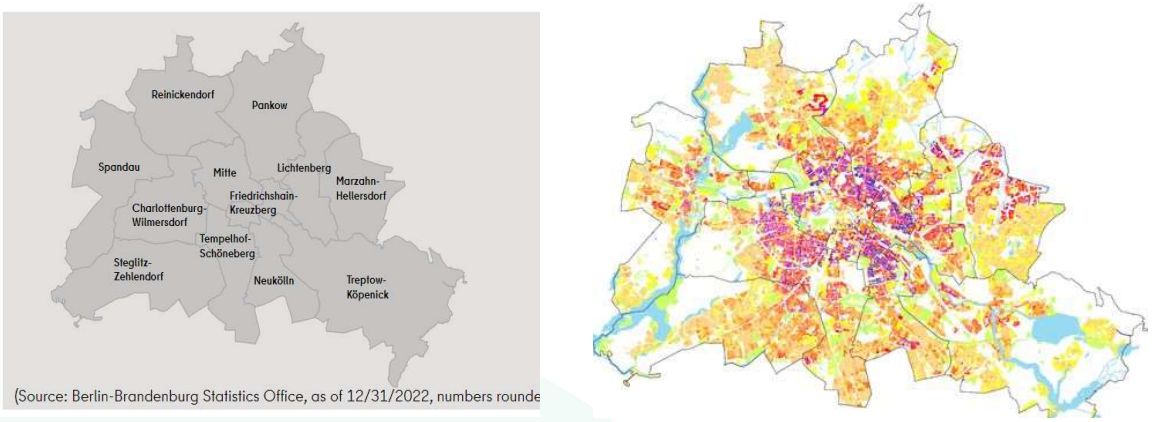


Figure 4 The Berlin city districts and the population distribution across the city. (source: Berlin statistics office)

As the capital of Germany, Berlin is the center of economic and political decision making. The major constitutional bodies in the Federal Republic of Germany are based in Berlin and diplomatic representatives from all over the world are also based in Berlin, making the city an important hub for German foreign policy.

The per capita GDP is 44.473 € (2021[2]). The 19% of the total workforce is employed in the trade, transport and storage, hotel/catering sector, the 30% in the other services sector, the 30% in the public service provider, education, health sector and the 5% in the manufacturing industry. Currently (reference year 2019) there are 768 industrial companies in Berlin with a total of around 111.700 employees. The chemical-pharmaceutical industry is considered to be the sector with the highest turnover and employment in Berlin. The manufacture of data processing devices, electronic and optical products, the metal and electrical industry, machine and vehicle construction, the food industry and the printing and paper sectors are other important branches of industry in the capital. Nearly 100 larger logistics businesses and 26 research institutions working in the fields of transportation logistics[3] and telematics are located in the Brandeburg region, employing 6.400 workers.
Regarding the land use statistics, the transportation infrastructure covers the 15 % of the city's surface and the settlement area the 56 %. More specifically the residential area coves the 27 %, mixed use area the 2,5 %, and commercial and industrial area the 5,4%. Vegetation represents the 23 % of the city's area, while water the 7%.
Not the whole state of Brandenburg is part of the FUA. Depending on how the FUA is defined it implements the direct sprawl around Berlin or the smaller towns along the infrastructure corridors (mostly rail) as well.

The City of **Prague** (CZ) has a population of around 1,28 million inhabitants and covers 496 km^2. Its population density is 2.571 inhabitants per km^2 (the population density in the territory

[2] Source: Fitch Ratings, https://www.berlin.de/sen/finanzen/vermoegen/geld-und-kreditgeschaeft/2022-12-13_fitch_rating-report_state-of-berlin.pdf
[3] Source: https://www.businesslocationcenter.de/en/logistic

of the Czech Republic is significantly low compared to the territory of Western Europe). The population trend is increasing mainly for the growth of foreigners in Prague.
The city, divided into 22 districts, is not evenly populated: the highest population density is in the centre of Prague, while on the outskirts, fewer people live in larger areas.

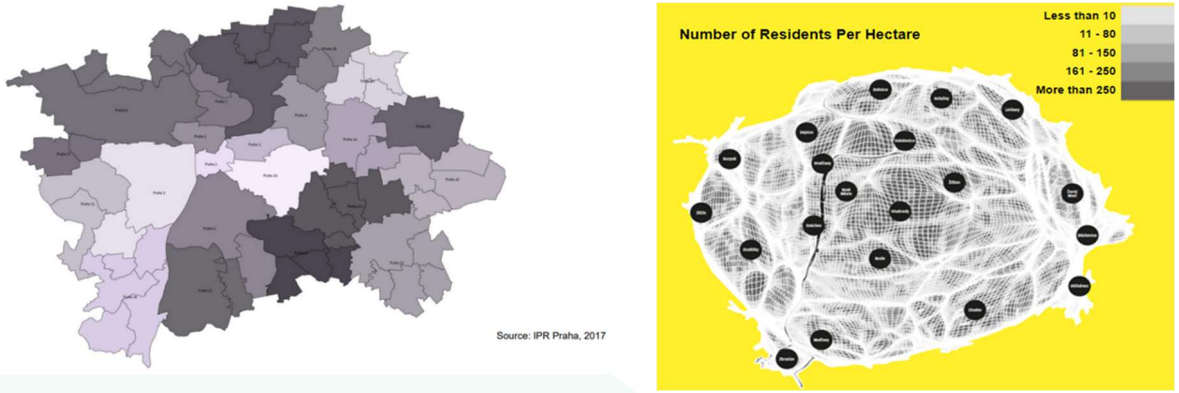


Figure 5 The Prague's districts (on the left) and a visual elaboration relating to the distribution of the population in the city.

The per capita GDP is 51.822 € (2021) and the representation of individuals with higher levels of education continues to rise.

632.250 economic entities have their registered office in Prague (January 2020). Among these, those that declared their core activity in the services sector prevailed (80.4%). This was followed by the construction sector (7.9 %) and manufacturing sector (7.4 %). In terms of technological/knowledge intensity, subjects focused on lower intensity activities prevailed (67.1 %). Among these, market services of less intensive knowledge dominated (44.5%), which mainly include wholesale, retail, food and beverage service activities. The manufacturing industry was also dominated by entities focused on sectors with lower technological intensity (6.5 %), namely printing and reproduction of recorded media, production of metal structures and fabricated metal products except machinery and equipment, clothing and food products.

As for land use statistics, residential area represents the 12% of total surface, commercial area the 5.5%, industrial area the 3%, while the leisure area covers the 9%.
As for the economic activities, the highest density of companies (more than 25 commercial establishments per hectare) was observed in the Old Town and New Town, in Vinohrady around Míru Square and Tylova Square, and in Smíchov near Anděl.

The FUA matches the Central Bohemia Region boundaries. The region relies heavily on Prague's logistics industry. While Prague is the center, the entire region collaborates closely, emphasizing the importance of collective efforts. Logistics plays a significant role in the region's economy, and its operations are primarily decentralized, with regional logistics solutions playing a vital role.

The City of **Riga** (LV) has a population of roughly 606 thousand inhabitants and covers 304 km^2. Its population density is 2.409 inhabitants per km^2. The population trend in Riga is decreasing, while the metropolitan area has a rather stable population.

The distribution of densities by distance from the city centre reveals Riga's "camel back" profile[4]. The densities between 3 and 4 kilometres from the city centre decreases sharply to increase again between 5 and 10 kilometres. This decrease in density is due to the existence of an industrial belt that today is mostly physically run down, the decontamination and restructuring of which would require substantial capital from developers. The increase in density between 5 and 10 kilometres is due to the existence of panel housing. The high density of the first 2 kilometres corresponds to the historical core of the city.

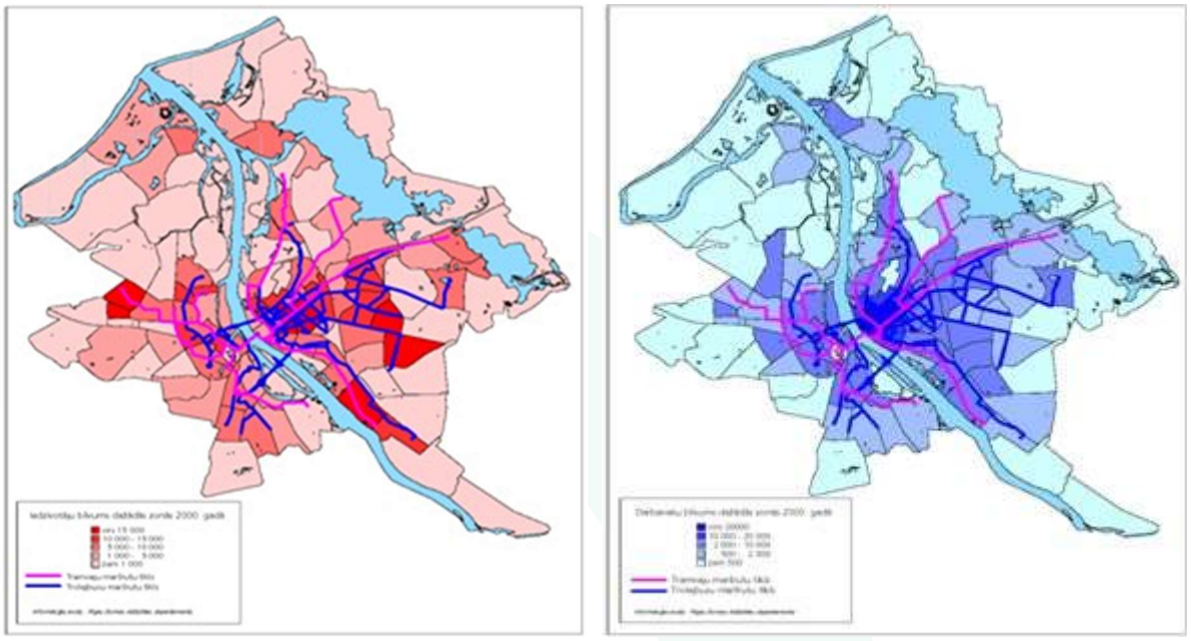


Figure 6 Population density (on the left) and job places density (on the right). Source "Transport Network in Riga (Latvia): State, Problems and Perspectives" by Irina Yatskiv, Elena Yurshevich, Transport and Telecommunication Institute (TTI).

The per capita GDP is 25.925 €[5]. 76.3% of all economically active companies in Latvia are operating in Riga. Services (179.091 employees), wholesale and retail trade (85.618 employees) are the most popular business sectors in the capital in terms of employee numbers. The most popular investment sectors were finance and insurance (24.3%), real estate (16.5%) and wholesale and retail trade (14.8%). Transport and logistics sector accounts for the 14% of the total value added of the city.

Regarding the land use statistics, Residential area takes up the 21.8% of the total area, Industrial area takes up the 17.0%, Street, roads and motorways take up the 8%, Parks take up 19.0% and Water takes up 15.8%. For commercial territories no valid data is available.

The FUA, as defined in 2021 administrative regional reform, is defined as the metropolitan area of Riga, or Riga Metropolitan Area. It is spread up to 100 km from the center of Riga. Riga serves work and service purposes, as most workplaces are concentrated in the central area of

[4] Source: "Note on Riga Spatial Structure" By Alain Bertaud and Deliverable "Case study report: Riga (LV)" from ESPON "Mista" project

[5] Source: https://stat.gov.lv/en/statistics-themes/economy/national-accounts/press-releases/15024-gdp-regions-2020?themeCode=IK

the city and many within the city border. People, who work in Riga, commute to the city on the daily basis, mostly by private vehicles.

The City of **Funchal** (PT), capital of the Autonomous Region of Madeira, has a population of 105.782 inhabitants (about 41% of the regional) distributed in ten parishes, and covers 76 km². Funchal is the most densely populated municipality of the Region (1.388 inhabitants per km²) and the urbanized area of the city extends from sea level to the mountainous area (the mountains reach approximately 1800 meters above sea level at the highest points). The population trend is decreasing, its inhabitants have reduced by the 5,5% from 2011 to 2021. The parish of Santo Antonio, which extends across almost the entire western area of the city, is the most populated, followed by Sao Martinho parish, occupying the South-western part of the city, and by Santa Maria Maior parish in the South-eastern part.

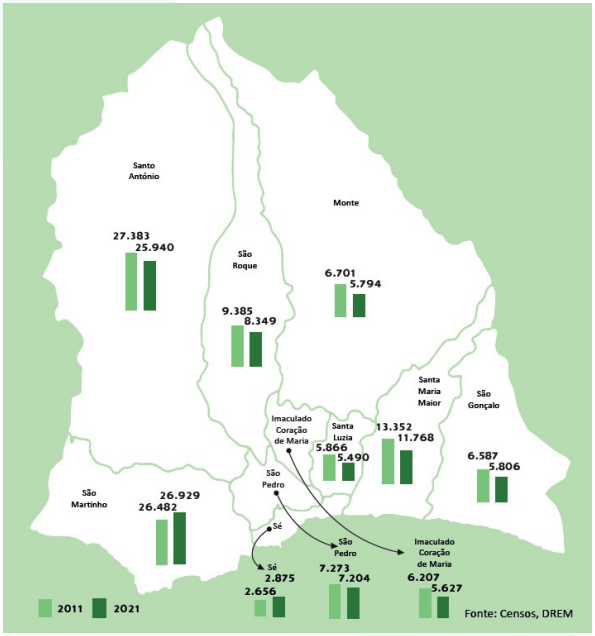


Figure 7 Municipality of Funchal and its parishes and population distribution (source BOLETIM ECONÓMICO FUNCHAL)

The Gross income per capita is 19.300 € and over 15.000 businesses are based in Funchal: 16% of these operate in the retail and wholesale sector, 14% are HORECA activities and 3% are transport and warehousing companies. Manufacturing industries represent the 2% of VAT registered companies.

In absolute terms, most of businesses and commercial establishments are based in the parishes of Sao Martinho and Sé.

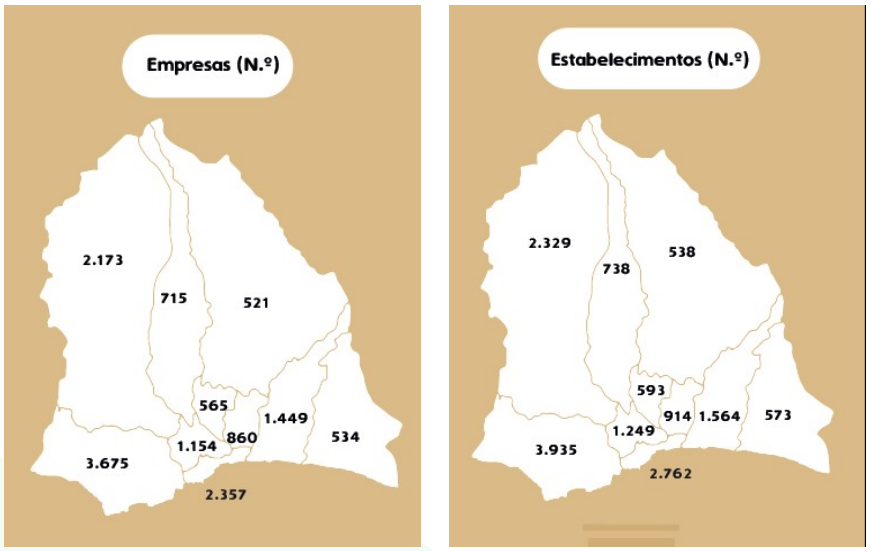


Figure 8 Number of registered companies (on the left) and of commercial establishment (on the right) by parish in Funchal (source BOLETIM ECONÓMICO FUNCHAL)

Within the employed population, 89 % works in the service sector.
Transport plays a fundamental role in the economic and social development of both Madeira and Funchal. The mobility of the population and the movement of goods and merchandise contributes to the dynamism of the economy and to the competitiveness of companies, with repercussions on the quality of life of the population.

As for the land use statistics, the residential area takes up the 26,25% of total surface, the central area takes up the 3,2%, the economic activities the 1,6%, the green spaces the 4% and the port area the 2%.

The FUA of Funchal can be considered the whole Madeira Island: the urban network is macro cephalous, where Funchal occupies the top of the hierarchy and maintains its hegemony.
Its insularity presents challenges for the Region in terms of transport and accessibility, and this is a major challenge since it involves a permanent effort to annul the isolation and maintain constant links with the outside world. However, it also presents opportunities since the island has a strong attraction and tourist potential.

The City of **Mechelen** has more than 88.000 inhabitants and has been registering an increasing trend in the last years (estimated to count 100.000 inhabitants by 2030). It covers 66 km^2 and has a population density of 1.347 inhabitants per km^2. As seen on the map, the highest density is in the city centre and the surrounding areas.

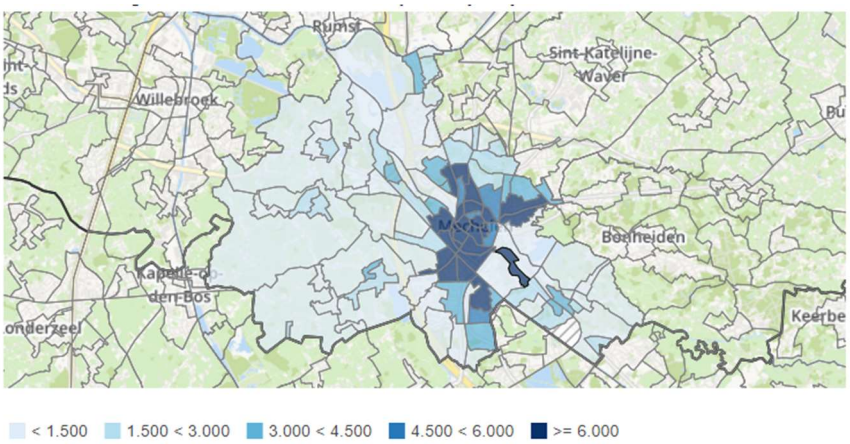


Figure 9 The Mechelen city districts and the population distribution across the city. (source: Mechelen Municipality)

In the urban area next to the inner city, we find quarters at its outskirts, namely the districts of Nekkerspoel and Battel, as well as the villages of Walem, Heffen, Leest, Hombeek, and Muizen. These are mainly urban housing areas with a high density. However, in the villages the density is lower as there are mainly detached houses with a larger total surface.
The peri-urban area includes the industrial zones in the north and south of the city. It also encompasses the main access road to the industrial area in the neighbouring municipality, called Willebroek.
Lately the city attracted more inhabitants, entrepreneurs, employers, visitors and tourists which implies a lot more traffic and transport flows.

The city's GDP per capita is 45.200€ and the VAT-registered companies are 7.957. Mechelen has a diverse economic environment: industrial areas, shopping areas, office and service sites, but there are also many facilities and production activities woven into the residential fabric[6]. The tertiary and quaternary sectors are gaining in importance in Mechelen and the secondary sector is declining in importance. The subsectors 'Wholesale and Retail Trade' and 'Business Services' are the most important sectors in the city in terms of both the number of companies and the number of employees. Both are also characterized by growth rates. More specifically, 56% of workers are employed in the tertiary sector, including services like commerce, tourism, transport and warehousing. The manufacturing sector employs the 14% of the workforce while the quaternary sector (including consultancy services, as well as activities in the IT and telematics sectors) occupies the 28% of the total Mechelen's workforce.

Regarding the land use statistics, Residential area takes up the 15,6% of the total area, Industrial area takes up the 3,5%, Commercial area the 1,1% and the leisure area the 5,4%.
30% of companies operate from industrial estates and as many as 70% of companies have their offices in interwoven and dispersed locations, most of which are mainly located in the city center.

Even if Mechelen is a secondary centre, it's an employment core located at a short distance from Brussels, Antwerp and Leuven with a large share of important economic spaces of a supra-local vocation. For this reason, the city fulfils a strategic position within the region.

[6] Source: https://www.mechelen.be/beleidsplan-ruimte-mechelen-ontwerp-analyserapport-werkende-stad

3.1.1 Comparing the local contexts.

Population, employment densities and land use are linked to freight generation. Economic classifications of employment help in estimating freight generation because different industry sectors have different demands for physical goods: for example, management or consultancy services generate less freight demand than retail services. The rise in home deliveries coming from the growth of e-commerce has started to create a direct relationship between density population and freight deliveries. Employment density affects the intensity of freight generation, as well.

As we can examine from the following graph, the cities involved in the project have very different socio-economic characteristics. Berlin and Madrid have very large populations that exceed 3 million residents, while on the other hand, we find medium-sized cities such as Mechelen or Funchal with a population of around 100.000 inhabitants.

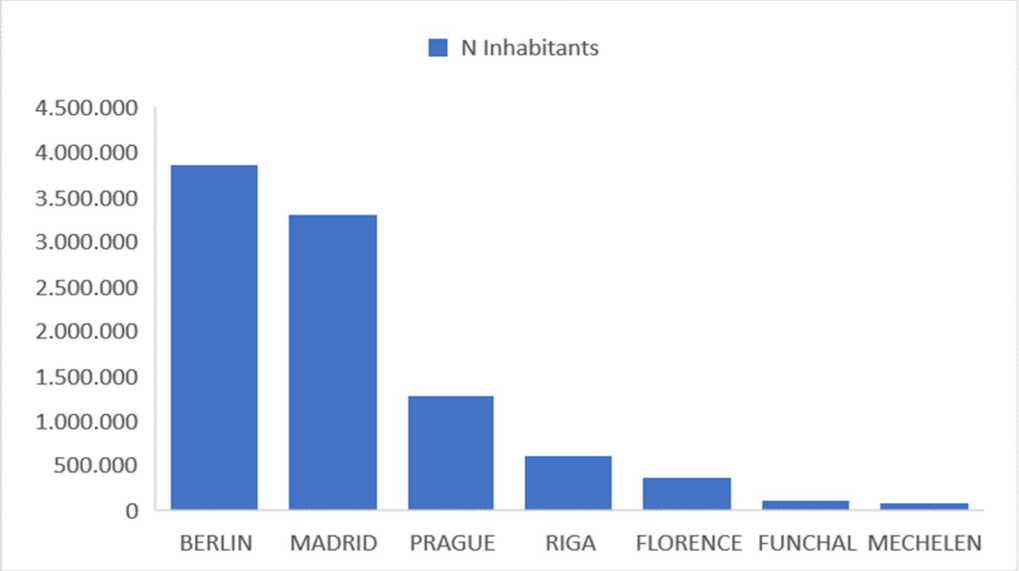


Figure 10 N. of inhabitants per city

It is also important considering that demographic trends, since these can point to an increasing concentration of last mile deliveries related to e-commerce in urban areas. Berlin, Prague and Mechelen populations' have been registering an upward trend since the early 2000s[7], mainly due to the increasing number of foreigners, and their population is expected to further increase by 2030, as stated by the three Cities in the questionnaires.

On the other hand, we find the cities of Madrid and Florence which have recorded a decline in the resident population, probably also partly due to the effects of the Covid-19 pandemic.

[7] Source: Berlin's population statistics: https://www.berlin.de/sen/sbw/stadtdaten/stadtwissen/bevoelkerungsprognose-2021-2040/#ergebnisse: Prague's population statistics: https://iprpraha.cz/page/3415; Mechelen's population statistics: https://mechelen.incijfers.be/dashboard/dashboard/.

Funchal is also suffering from the reduction of the inhabitants, a dynamic that is being recorded throughout the island of Madeira. Finally, it is worth making a note regarding the city of Riga, where population decline can be considered as one of the biggest problems of the city. The post-socialist transition brought a lot of problems and also the 2008 economic crisis was very strong, leading to large emigration flows, huge brownfield areas and many empty buildings.

Table 1 Population trend in the seven cities: the upwards arrow indicates an increasing trend, downwards arrow indicates a decreasing trend

	MADRID	FLORENCE	BERLIN	PRAGUE	FUNCHAL	RIGA	MECHELEN
Population trend	↓	↓	↑	↑	↓	↓	↑

Even more interesting is comparing cities based on their surface area and the average density of inhabitants per square kilometre: this data allows us to evaluate the pressure exerted on the territory by urbanisation in the 7 municipalities.

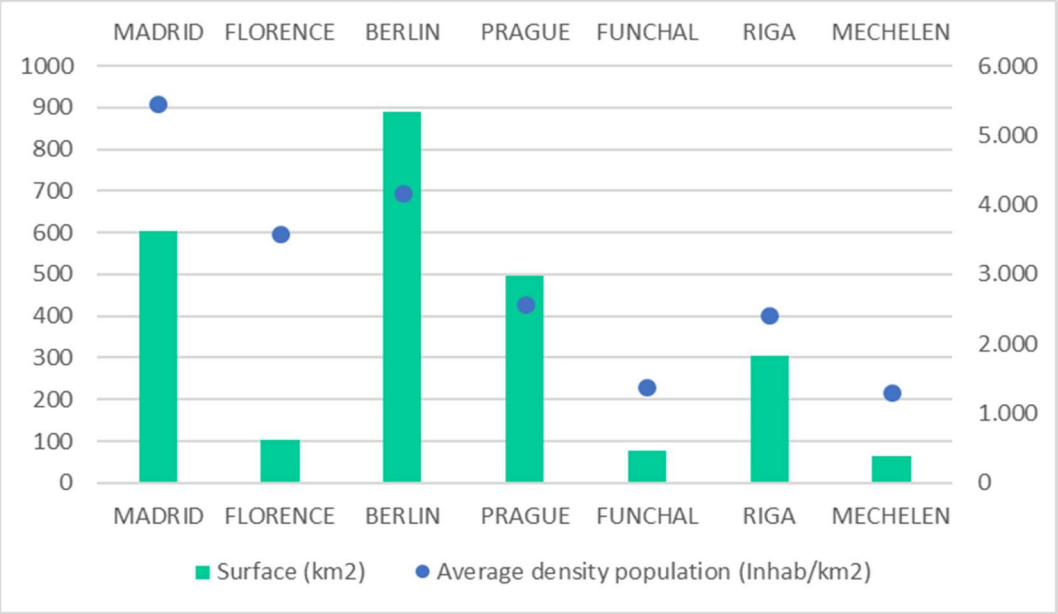


Figure 11 Comparing cities' area and average density population.

Madrid is the city with the highest population density: in the more central neighbourhoods of Chamberí, Tetuan, and Salamanca the population reaches almost 30.000 inhabitants per km^2. Also, the case of Florence is particularly striking for its high population density compared to the other cities: in the historic centre almost 6.000 residents are living. Nevertheless, to this data we must add the very strong tourist flow (around 15 million visitors per year) and concentration of hospitality and commercial activities that make this area of the city particularly saturated: in fact, the historic centre of Florence is a point of concentration on a global level for the supply of apartments for temporary use. The phenomenon is obviously linked to the tourist role of the city. The data relating to the strong pressure is confirmed by the statistics relating to land use. Based on the data communicated by the cities, Florence is

the city that, in percentage terms, has the highest rate of urbanized land (excluding the land covered by transport infrastructures).

Table 2 Land use: details about residential, commercial, and leisure area in the 7 cities (values in % over the total surface)

	MADRID	FLORENCE	BERLIN	PRAGUE	FUNCHAL	RIGA	MECHELEN
Residential Area	10,5	36	29,5[8]	12	29,45	21,8	15,6
Commercial and Industrial Area	6,1	14	5,4	8,5	1,6	17	4,6
Leisure Area	10,2	8	5,1	9	4	19	5,4

Also, the city of Berlin registers in the city centre a density that is well above average. The more people inhabit a city, the greater the environmental burdens – caused by for example noise and road traffic emissions.

Funchal is, together with Mechelen, the city with the lowest average density population. Nevertheless, it is important considering that it is the most densely populated municipality of the Region of Madeira and that the occupation of the territory does not happen in a homogeneous way, since the settlement of the population is generally below 700 meters.

As illustrated in the previous paragraph, it can be generally said that most of the seven cities are comprised of three zones of increasing urban density. While restrictions regarding logistics use varies city by city (as will be further illustrated in the next paragraph) in general higher urban density relates to greater impediments to logistics land use.
The distribution of built-up land between residential and commercial uses does not show much variation by comparing cities: areas with higher population density, that is residential area, are well distributed across the cities with a maximum not very far from the city centre, as well as the commercial establishments and HORECA. Businesses appear at a similar distance as residential but peaking a little further, while logistics and industry are preferentially located in the periphery.

As mentioned at the beginning of this paragraph, changing demographics and evolving economic conditions, especially in the context of e-commerce growth, impact logistics challenges and solutions in each city.

The transport of goods by road has quality and flexibility advantages over other modes of transport, so that the growth in freight transport in recent years has been particularly noticeable in road transport. However, compared to other vehicles, freight vehicles have a

[8] It includes also the Mixed Use Areas. Mixed use areas may be similar to primarily residential areas in appearance. However, the housing is more strongly interspersed with commercial and service enterprises (department stores, offices, etc.), cultural facilities and small businesses. In exceptional cases, housing may account for as much as two thirds of the area, but as a rule, commercial, service enterprises and other small businesses predominate. Source https://www.berlin.de/umweltatlas/en/land-use/actual-land-use/2010/map-description/

disproportionate impact on traffic and the environment. In urban areas, freight vehicles make up between 15% and 25% of all vehicle kilometres travelled. But they take up between 20% to 40% of all road space, contribute 20% - 40% of CO_2 emissions and are responsible for 30% to 50% of the main air pollutants (PM and NO_x) (Smart Freight Centre, 2017).

Moreover, concentration of economic activities and population in European cities are very high and rising, producing new challenges for urban freight distribution.

The rising prices of real estate in city centres caused urban sprawl and demand for just-in-time deliveries and zero stock policies by retailers result in low vehicle load factors and a consequent increase of negative externalities.

Population and urban density together with economic factors can influence logistic development in different ways. For example, a growing economy will need more freights delivery, but in periods of economic crisis e-commerce will also be boosted: in both cases the trend is increasing but with different approaches.
The fragmentation in loads and trips mostly depends on the recent growth of e-commerce and instant deliveries, accelerated by the pandemic and contributing to an increase in the number of deliveries, while adding new types of 'light' freight traffic such as cargo-bikes, scooters, vans. The increase of small and unpredictable B2C deliveries creates strong downward competition amongst operators who are forced to deliver products as fast as possible, even with half-empty vehicles, to gain customer trust.
For logistics and transport in urban areas, the sharp increase in online trade means a generally strong increase in the frequency and number of shipments in courier, express and parcel logistics. Freight traffic in the city is thus increasingly characterized by light commercial vehicles up to 3,5 tons[9].

According to the urban freight transport system analysis carried out by the city of Madrid[10], the continuous growth of e-commerce means that the global impact of on-line business on the UFD is expected to reach an impact equal to the one produced by more than 40.000 local stores in the next few years.

In Germany, the economic growth of recent years has also resulted in an increase in freight traffic. According to studies by the Federal Ministry of Transport and Digital Infrastructure, the transport performance of freight transport - measured in tonnes in Germany between 1991 and 2016 - increased by around 20 percent overall, as reported in Berlin's SULP. Moreover, according to the traffic forecast, the amount of freight moved is predicted to rise by 38 % by 2030 compared with 2010 levels[11]. As the road mode of transport represents the greatest challenge in terms of consequences such as land use, infrastructure use and pollutant emissions, etc, it can be stated that the use and, above all, securing alternative modes of transport, is therefore an important element in maintaining options in the long term.

[9] Souces: Berlin's questionnaire and SULP; Madrid's questionnaire; FMA's SULP; Funchal questionnaire.
[10] Estudio de viabilidad para el desarrollo de soluciones logísticas, Ayuntamiento de Madrid (2016 - 2017)
[11] https://bmdv.bund.de/SharedDocs/EN/publications/2030-federal-transport-infrastructure-plan.pdf?__blob=publicationFile

In Germany, the efficiency improvement potential of today's drives can be used, switching to alternative fuels for road deliveries. The rail freight transport plays a central role in the 2050 climate protection plan in order to meet the set targets. The potential for performance and development in rail freight transport that has not yet been fully exploited, which can make a significant contribution to overcoming the challenges of transport and climate policy, is to be tapped in the future.

Madrid will encourage the enhancement and the sprawl of pick-up points. On this line, some public infrastructures such as transport interchanges and busiest Metro stations could be used as micro-depots, which could provide the following advantages:

- Additional income for the Transport Consortium.
- Expansion of the services offered to users of the public transport network, which could lead to greater loyalty and potential growth in the use of the public transport by new users.

In case of Florence, the municipality has worked in close cooperation with the metropolitan city to design a sustainable mobility plan for people (including commuters and the 15 million of tourists per year who have relevant impacts in this case) and freights based on a concentric eco-road pricing model and logistic system and supporting multimodal split.

Also in Prague, as the numbers of inhabitants are expected to keep rising, the resulting traffic intensity development may be altered by increasing toll fees and increasing its use of public space currently used by cars (details of how the Prague Toll System should be structured were already assessed in 2020 in a feasibility study). For what it concerns the negative impacts of the sharp growth of e-commerce platforms and home deliveries, using self-service parcel boxes is one solution to reduce the km run by lorries and vans, as indicated in the Prague's SECAP. Another crucial measure of city logistics connected to a reduction in motor vehicle transport is the operation of city-based depots based in strategic locations, used to move parcels from lorries to couriers on foot, or to cargo bicycles. Incorporating railway and river transport into city logistics is also planned; nevertheless, these two modes of transport face a major obstacle represented by the high-cost infrastructure and as a result difficult planning and project implementation.

3.2Main challenges

The following section is dedicated to the logistics system issues analysis, based on the feedback provided from the cities: the questionnaire, in fact, also included a question regarding the main challenges and barriers for the optimal control and management of the logistics sector and for the reduction of its impacts on the environment, the quality of life and safety.

The information provided through the questionnaire has been integrated by further information gathered from the SUMPs/SULPs.
The identified challenges have been classified into 5 categories:

- Legislation: this category includes all those legislative and regulatory aspects preventing logistics efficient development (i.e., the absence of updated urban logistics laws, guidelines, regulations, and comprehensive strategies, an ever-changing political agenda and fluctuating regulatory regimes, the inconsistency of guidelines within cities, etc).
- Infrastructures: this category refers to those infrastructure elements that could be ill-tailored for logistics purposes and/or to the unavailability of suitable infrastructure and specifically designated logistics areas.
- Data: under this category are listed those elements that could represent a barrier to logistics-related data collection (access and security, availability of data, data governance and regulatory compliance, etc)
- Business model/economy: this category is related to those elements that represent a hamper to building functioning business models that could foster innovative logistics concepts to continue beyond the pilot period (because of specific requirements, regulations, and the general market situation).
- Social acceptance: this category encompasses various factors that hinder the positive acceptance of new concepts by citizens and users.

In the following table, the main challenges pointed out by the cities have been listed:

Table 3 Main challenges detected by the 7 cities.

Typology of Barrier	Barrier	MAD	FLO	BER	PRA	FUN	RIG	MECH
LEGISLATION	Lack of a systemic vision and planning related to freight distribution					●	●	
	Illegal parking in dedicated parking spots			●	●	●		
	Lack of knowledge and awareness in the administration as for Urban Freight Logistics				●	●		
	Space as the scarcest resource				●	●		
	Cultural heritage boundaries		●		●			
	Bureaucratic procurement procedure						●	
	Need for flanking policy							●
INFRASTRUCTURES	High flows of tourists and city users (crowded centers)		●	●		●		
	Lack of loading & unloading areas	●	●	●	●			
	Lack of freight hubs				●	●		
	Road network poor quality /the final stage of transport infrastructures' life cycle			●			●	
	Growing need for storage and transhipment facilities in urban areas			●				
	Traffic jams management due to temporary obstacles			●			●	

Typology of Barrier	Barrier	MAD	FLO	BER	PRA	FUN	RIG	MECH
DATA	Fear of sharing data with other logistics operators and with the Cities		●					
	Growing e-commerce sector increasing the share of UFD (major difficulties to monitor freight transport data)	●		●				
	Lack of data about logistics	●	●		●	●	●	●
	High operational complexity and high fragmentation of the freight sector			●				●
	GDPR compliance, there is no systematic approach to data monitoring				●			
BUSINESS MODELS ECONOMY	Difficult to establish a business model that can improve freight operations due to micro logistics operators					●		
	Lack of protocols and agreements between public and private sector/Challenge to establish collaboration with major delivery companies	●	●	●	●		●	●
	No municipal funding for micromobility						●	
SOCIAL ACCEPTANCE	Social resistance to the expansion of loading capacity in parking spots			●	●	●		
	Complaints about trucks loading & unloading in streets causing traffic congestion and nuisance for residents	●		●	●			
	Lack of political support				●			
	Slow adaptation of citizens to market offered solutions (lockers for post and packages, ordering food, groceries and household products online with delivery services etc.)						●	

According to the results of the questionnaires, the most common problem to the cities (MAD, FLO, BER, PRA, RIG, MECH) is the lack of cooperation among actors and the lack of accurate data about logistics. As also deliberated during the first two General Assemblies of the UNCHAIN project[12], cooperation between stakeholders is critical for successful implementation of city logistics initiatives in all typologies of cities. Stakeholders, including shippers, freight carriers, administrators, commerce and manufacturing sectors, HORECA, residents are involved in city logistics with very different objectives and perspectives for the urban freight transport. Logistics operators are mainly interested in maximising their profits, while administrators try to reduce traffic congestion and local emissions and residents are keen to ensure safety and security of communities.

[12] The 1ST General UNCHAIN project assembly was held in Brussels on 09th-10th May 2023. The 2nd General Assembly was held in Florence on 19th-20th September 2023.

Figure 12 Most common challenges to logistics reported by the cities.

On the other hand, the data sharing between public sectors and private companies is important for modelling, planning and assessing policy measures related to city logistics. However, there are issues of confidentiality of logistics companies, costs of collecting data, regulations by law and lack of tools for analysing data. This lack of data hinders the proper monitoring of the evolution of urban logistics (like the e-commerce penetration, door-to-door courier delivery, alternative means of freight transport, etc.).

As declared by cities (MAD, FLO, PRA, RIG, FUN, MECH) little data/no sufficient data is available at the urban level, and data collections are not systematic; therefore, existing data is not comparable. The lack of statistics hinders policy development, given a more sustainable urban freight sector[13].

The lack of loading and unloading bays is another common issue identified by the cities (MAD, FLO, BER, PRA, FUN) occurring mainly in the city centres and in all those area with a high economic activities' density. Commercial traffic is by no means evenly distributed throughout the day, but shows different temporal distributions depending on the segment, with

[13] The city of Prague has specified, in its questionnaire, some information that are missing at city level and might be needed:

- Delivery Volume: Data which determines the volume of goods being delivered by the freight company on a daily, weekly, or monthly basis. This information can help assess the scale of these companies' operations and understand the curb side or other types of infrastructures' capacity needed to accommodate their operations.
- Delivery Patterns: Data which shows delivery patterns, including peak hours, days, or seasons when the demand is highest and lowest. This data would help in optimizing resources and planning street usage effectively.
- Intensity of Travel: statistics about the transportation intensity of logistical companies throughout the city.
- Delivery Timeframes: Data that helps us understand the timeframes within which the company needs to make deliveries. This includes customer expectations for timely deliveries.

concentration in some peak hours (especially during the morning hours), that are also the most concurred by private traffic. The lack of curb space, missing parking for delivery vehicles, but also illegal parking in the pick-up/drop off area, lead to "stopping in the second row" for loading and unloading operations and thus cause considerable traffic obstructions and conflicts, among others with bicycle traffic, rescue services, but also with commercial traffic itself.

This problem is even intensified, as pointed out during the project meetings, by the strong eCommerce growth increasing the Business to Consumer (B2C) segment's market share and related delivery operations, along with customer requirements in terms of speed of delivery (same-day delivery). At the same time, the shortened delivery times in connection with smaller consignment sizes make it more difficult to exploit consolidation potential over the last mile. The result is a high delivery frequency, low utilization of the delivery vehicles and a higher commercial vehicles flow.

Four cities out of seven (MAD, BER, PRA, FUN) report the social issue represented by the social reluctance among the public (both residents and visitors) to increase the space intended for logistics purposes and the presence of commercial vehicles carrying out loading/unloading operations. One major cause of user resistance is the lack of awareness and understanding: users often fail to recognize the need for and benefits of innovative logistics concepts, as the challenges associated with logistics are not readily apparent to them. Moreover, as remarked by the city of Riga, citizens are slowly adapting to the market offered solutions (lockers for post and packages, ordering food, groceries and household products online with delivery services etc.).

Three cities (BER, RIG, PRA) underline the growing need for storage and transhipment facilities in urban areas that comes up against the lack or the shortage of freight hubs.

The cities of Funchal and Riga point out that the lack of a systematic vision and of a planning approach to logistics represent a challenge. More specifically, the city of Funchal draw attention to the lack of any legal framework regarding freight logistics in the Municipality, which leaves all the logistics to be done by the private sector distributors.

Also, the city of Prague remarks that there is not a coordinated and cross-sectorial planning, and few resources are dedicated for urban freight at the local level. Urban logistics is not properly integrated into urban transport and economic development strategies. This hampers an optimal management of the activity sector, along with the lack of knowledge and capacities of the public administration about logistics. This deficiency in knowledge and administrative capabilities further complicates the process of comprehending and implementing appropriate legislative and policy-driven solutions. Without a comprehensive understanding of the intricacies surrounding these operations, it becomes challenging to discern the most suitable regulatory frameworks and policy adjustments necessary to accommodate the burgeoning demand.

In Florence the main problem is represented by the cultural heritage boundaries and the overcrowded narrow streets of the historical centre, making it difficult carrying out the logistics operations and affecting the quality of life for people living in the central district.

The city of Berlin and Riga point out that part of the transport infrastructures reach the final stage of their life cycle or have poor quality. Therefore, major investments and construction activities must and will be taken to reconstruct/refurbish transport networks.

The city of Mechelen reports the high complexity and high fragmentation of the freight sector and the difficulty to gather accurate and up-to-date numbers about freight in the city. As also stated by the city of Prague, there exists a significant gap in the ability to accurately monitor and document the influx and outflow of goods within the city. This deficiency extends to tracking not only the quantity of goods but also the specific types of commodities being transported, along with identifying the operators responsible for these movements. The absence of such comprehensive tracking mechanisms hampers the capacity to effectively manage the evolving landscape of goods transportation.

The strong increased presence of small operators caused by growing e-commerce and instant deliveries sector has also been highlighted by the cities of Berlin and Madrid. The rising prices of real estate in city centres caused urban sprawl and demand for just-in-time deliveries and zero stock policies by retailers result in low vehicle load factors and a consequent increase of negative externalities.

Once examined the major issues cities face in urban logistics, some general suggestion to overcome them, based on literature review, are provided as follows.

A shared understanding of each logistics' stakeholder impact on the local context as well as their contribution to the defined objectives and their potential rewards, is a prerequisite to select the most appropriate actions. It's quite a tough task since tackling the last mile delivery issue at system level may involve a combination of numerous key actors that play different roles (public authorities, transportation providers, retailers and HORECA, infrastructure providers, Connectivity and ICT system integrators, etc).

For this very reason, different aspects must be considered when it comes to defining urban logistics strategies at system level[14]:

- The adoption of a specific measure can positively influence one objective, while negatively influencing another. For example, switching all deliveries to electrical trucks would imply a reduction of noise and emissions, but could simultaneously increase congestion levels due to their smaller load and subsequent increasing in numbers of trips.
- Some solutions imply higher total transportation costs, due to added transhipments or usage of more costly transportation modes. They are economically viable only if they have sufficient volumes and generate significant operational gains in last mile

[14] François-Joseph Van Audenhove, Sam De Jongh, Marc Durance, Urban Logistics. How to unlock value from last mile delivery for cities, transporters and retailers. Arthur D. Little Future of Urban Mobility Lab, May 2015

delivery (e.g. through increased truck usage). Alternatively, they require subsidies or privileged access to the city centre.

- Not all solutions are attractive for all the logistics actors. For example, UDCs are less interesting for big-box retailers as they already optimize truck loads before delivering to stores in cities. This lever is only applicable when there is a sufficient presence of (independent) retailers without an optimized last mile supply chain.
- Financial interventions from public and local authorities are often required to support the economic viability of sustainable urban logistics strategies.

Therefore, besides considering the different interests at stake, further success factors helping to define a successful urban logistics strategy are:

- Perform a careful cost-benefit analysis (also a cost-effectiveness and/or Multicriteria Decision Making) of each stakeholder group involved individually and in combination with others, allowing for assessment of synergies as well as conflicting impact. This would also consider the right set of regulations, as well as incentives to put in place in order to foster their deployment.
- Use pilot actions in demonstration areas to reach an agreement on the most appropriate strategy before starting a full implementation.
- Harmonize regulations to make implementation at city or district level possible. It is important to strive for harmonization of regulations across cities and regions, in order to ensure that nationally active logistics companies can reduce their compliance costs as much as possible.

It can be stated that Public-Private Partnerships (PPP) and collaborative decision making seem essential for achieving the common objectives of city logistics: Cities' administrations and logistics actors need to collaborate for planning, implementing, and evaluating city logistics policy measures.

Establishing clear protocols related to public space usage, time slots, vehicle restrictions, compliance measures is, without a doubt, necessary, likewise establishing data-sharing pacts, since managing data can unlock a wide array of opportunities for the mobility ecosystem. It is a major success factor for logistics companies on the one hand, since real-time freight data sharing and route optimizations would help the operators to respond to delays more quickly, reduce dwell times and reap the efficiency benefits. A low carbon freight report estimated that the collaboration between operators using shared data platforms can yield cost savings of up to 20%[15]. On the other hand, it helps public authorities to plan and implement the most suitable measures to manage the flow of goods and services within urban environments on the other.

The risks associated with an individual company sharing data are often perceived to outweigh the benefits. Yet, if all companies share the same data that risk is neutralized; so, a regulatory requirement and enforcement mechanism are necessary to ensure that all companies are sharing the same data and to drive adoption[16]. Consequently, Cities first have to provide a

[15] https://docs.wbcsd.org/2017/05/Road_Freight_Lab.pdf
[16] Solving the Global Supply Chain Crisis with Data Sharing, Coalition for Reimagined Mobility

policy-guided data-sharing framework that promotes the use of data safely and collaboratively[17], outlining what data should be shared, how, who can access it and stipulating data usage, protection guidelines, and penalties for data misuse.

Besides, it is important guaranteeing the quality of data as the standardisation of the method for collecting and processing it is critical for analyses.

All of this without forgetting the challenge represented by the GDPR compliance: in an industry reliant on vast amounts of data for operations, including customer details and delivery information, navigating consent requirements, data security protocols, and breach notification obligations becomes intricate. Third-party data sharing and the exercise of individual rights over personal data further complicate matters. Without a structured approach to data monitoring, including audits, impact assessments, and technology solutions, ensuring ongoing compliance and safeguarding against potential fines becomes increasingly complex.

4 Urban logistic systems description

4.1 Infrastructures: city layout, logistical nodes and service infrastructures at city level

Urban logistics infrastructures form the backbone of efficient goods movement within cities. Each of the seven cities exhibits a unique layout and logistical infrastructure shaped by its geographic, economic, and cultural context.

Madrid, Spain's capital, faces urban logistics challenges due to its dense population and bustling economic activity. The city employs smart traffic management systems and encourages the use of electric delivery vehicles to enhance efficiency and reduce environmental impact. Madrid's logistical infrastructure reflects the collaboration among logistics firms, retailers, and government entities to manage urban logistics effectively.

Madrid, Spain's central logistics hub, embraces a multifaceted stakeholder landscape. Couriers like Correos and SEUR ensure the efficient delivery of parcels, while associations like UNO and AECOC drive industry standards. Collaborations with urban mobility startups and local governments highlight Madrid's commitment to modernizing its logistics infrastructure.

- *City Layout*: The city's layout is characterized by a central core surrounded by diverse neighbourhoods and districts. The inner city consists of historical and commercial areas, while the outskirts feature residential zones and industrial districts. Understanding this layout is important for efficient urban logistics.

[17] Yiqian Zhang blog, Sustainable Mobility Officer, ICLEI World Secretariat

- *Transportation Hubs and Nodes:* Madrid boasts an extensive network of transportation hubs and logistical nodes. Adolfo Suárez Madrid-Barajas Airport, one of Europe's busiest airports, connects the city to international markets, facilitating the import and export of goods. Madrid's strategic location in the heart of Spain makes it a pivotal hub for road and rail transportation. Major highways converge on the city, and Atocha Railway Station serves as an important rail link for freight transport.
- *Road Network*: The road network in Madrid comprises a network of highways, avenues, and streets that facilitate the movement of goods and services. The city's logistics heavily rely on well-maintained roads, allowing for efficient urban distribution and last-mile deliveries. Madrid's road infrastructure is complemented by an extensive public transportation system, which includes buses, trams, and the Madrid Metro.

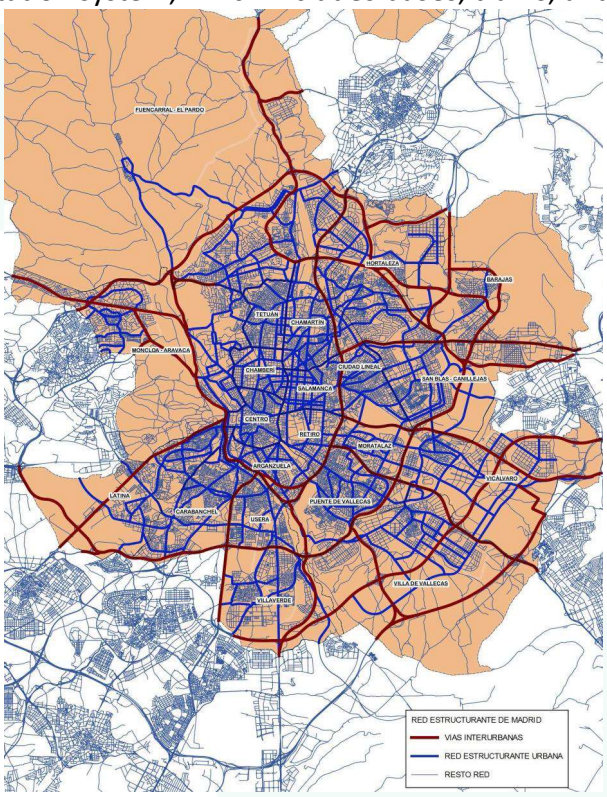


Figure 13 Road network in Madrid (source Madrid's SUMP)

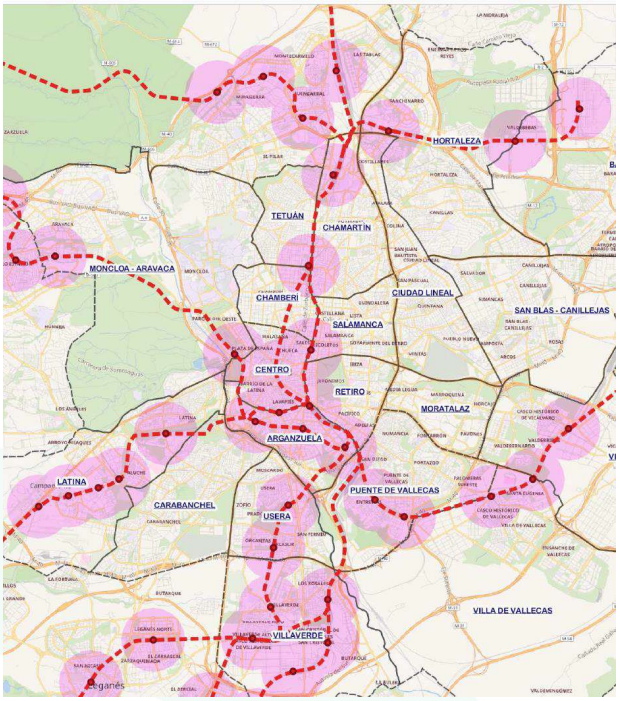


Figure 14 Rail infrastructure in Madrid (source: Madrid's SUMP)

- *Industrial Zones and Warehousing:* Industrial areas are strategically located throughout Madrid to support manufacturing, warehousing, and logistics operations. Key industrial zones include Vicálvaro, Vallecas, and San Fernando de Henares, providing ample space for businesses to establish warehouses and distribution centres. These areas are important for the storage and movement of goods within the city.
- *Service Infrastructures:* Madrid's service infrastructures encompass a wide range of facilities, including healthcare, education, and public administration offices. Ensuring efficient urban logistics is not limited to the movement of goods; it also involves the delivery of essential services to residents. The layout of these service facilities influences the flow of personnel, resources, and supplies throughout the city.
- *Commercial Areas and Retail Centres*: Madrid features commercial areas and retail centres, such as Gran Vía and Sol, where businesses rely on timely deliveries to restock their inventory. The distribution of goods to these areas demands well-organized logistics strategies to navigate the city's bustling streets and meet consumer demands.

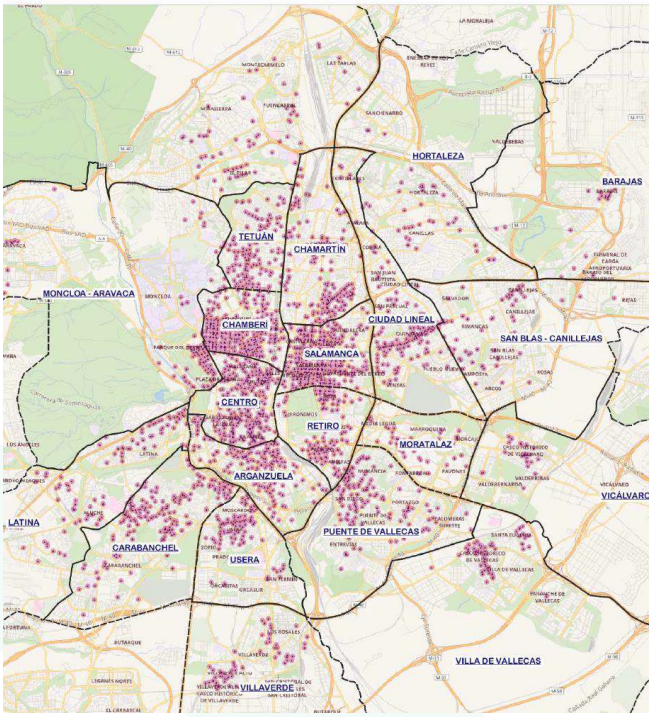


Figure 15Loading and unloading bays in Madrid (source: Madrid's SUMP)

Florence, known for its historical significance, has adapted to urban logistics challenges by embracing cargo bikes, microhubs, and advanced parking management systems. Its narrow streets and topography necessitate innovative solutions. Microhubs serve as consolidation points for cargo bikes, optimizing the last-mile delivery process. Florence's layout promotes sustainable and efficient urban logistics, reducing traffic congestion and enhancing the city's liveability.

Couriers like Bartolini and SDA, along with e-commerce platforms, enable efficient parcel deliveries. Local retailers in the historic city centre collaborate through associations, while the University of Florence provides academic insights into urban logistics solutions.

- *City Layout:* Florence's city layout is characterized by a well-preserved historic centre that dates back centuries. The city is divided by the Arno River, with iconic landmarks like the Florence Cathedral (Duomo), Uffizi Gallery, and Ponte Vecchio adorning its banks. The compact historic centre, a UNESCO World Heritage Site, features narrow, winding streets and piazzas that contribute to its charm. While the historic core is pedestrian-friendly, modern developments extend beyond, incorporating wider streets and modern infrastructure.
- *Logistical Nodes:* Florence's logistical nodes are strategically located to support the city's economic activities. The primary logistical node (Central Tuscany Interport, 91000m2 of warehouse) is the industrial area situated on the outskirts of the city, where manufacturing and warehousing facilities are concentrated.
- *Service Infrastructures:* Florence boasts a developed network of service infrastructures that cater to the needs of its residents and tourists. The city's healthcare facilities, including hospitals and clinics, are distributed across different neighbourhoods. Educational institutions, including universities and schools, are strategically located to

ensure accessibility for the population. Florence's service infrastructure also encompasses cultural institutions, such as museums, theatres, and libraries, which contribute to its status as a global cultural capital.

- *Challenges and Modernization:* Despite its historical charm, Florence faces logistical challenges associated with its narrow streets, limited parking, and restrictions on vehicular access in the historic centre. To address these challenges, the city has implemented sustainable urban mobility solutions, including pedestrian zones and restricted traffic areas. Additionally, investments in smart city technologies, such as traffic management systems and digital infrastructure, aim to enhance the efficiency of urban logistics while preserving the city's character.

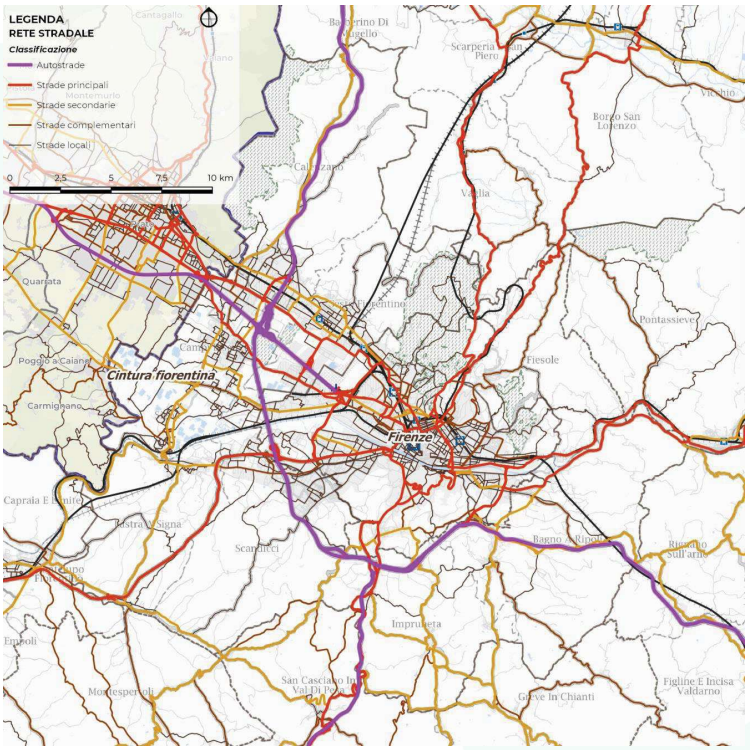


Figure 16 The road network in the city of Florence and its belt (source FMA's SULP)

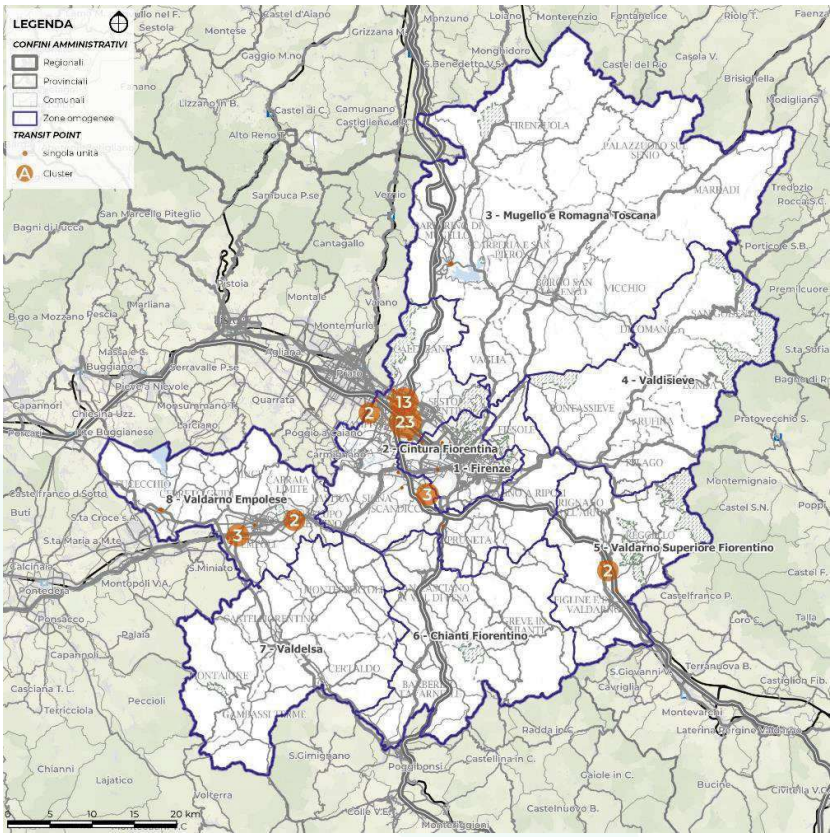


Figure 17 Logisitcs companies and logistics clusters in the FMA (source FMA's SULP)

Berlin, Germany's capital, features a diverse logistical infrastructure that reflects its dynamic economic activity. The city employs measures like restricted zones and low-emission areas to manage traffic and environmental impact effectively. Berlin's logistics infrastructure accommodates various stakeholders, including logistics firms, retailers, and government bodies, contributing to efficient urban goods movement. The city's layout fosters collaboration among stakeholders to address logistical challenges.

- International couriers like DHL, DPD, and GLS coexist with local players. Industry associations such as IHK Berlin and the German Logistics Association (BVL) shape the logistics landscape, emphasizing innovation and sustainability. Berlin's commitment to eco-friendly initiatives is evident through its collaboration with environmental organizations and electric vehicle initiatives.
- *Transportation Infrastructure*: Berlin is crisscrossed by a dense road network with efficient national connections, facilitating the seamless movement of goods within the city and across the country. Motorway connections radiate in all directions, enhancing regional connectivity.
- *Freight Transport Centres*: The city is strategically equipped with three major freight transport centres: Großbeeren, Freienbrink, and Wustermark (GVZ), all strategically positioned to facilitate the efficient flow of goods within the Berlin area.
- Container Terminal: Berlin boasts an inner-city container terminal, GVZ Berlin-Westhafen, which plays an important role in handling containerized cargo within the city.

Figure 18 Freight transport centres location (source municipality of Berlin)

- *Air Freight Capabilities:* The presence of an international airport equipped for air freight handling further augments Berlin's logistical capabilities, enabling efficient air cargo operations.
- *Rail and Waterway Access*: Berlin features multiple access points to the rail freight transport system, enhancing connectivity with the rail network. Additionally, the city benefits from efficient access points to the inland waterway network, further diversifying transportation options.
- Berlin's significance extends beyond its borders, as it serves as a Urban Node within the TEN-T network, ensuring excellent accessibility both within Germany and abroad. Three major European transport corridors converge in Berlin: The Orient-Eastern Mediterranean Corridor, North Sea-Baltic Sea Corridor, and Scandinavia-Mediterranean Corridor. This intersection symbolizes Berlin's integral role in European integration and trade.

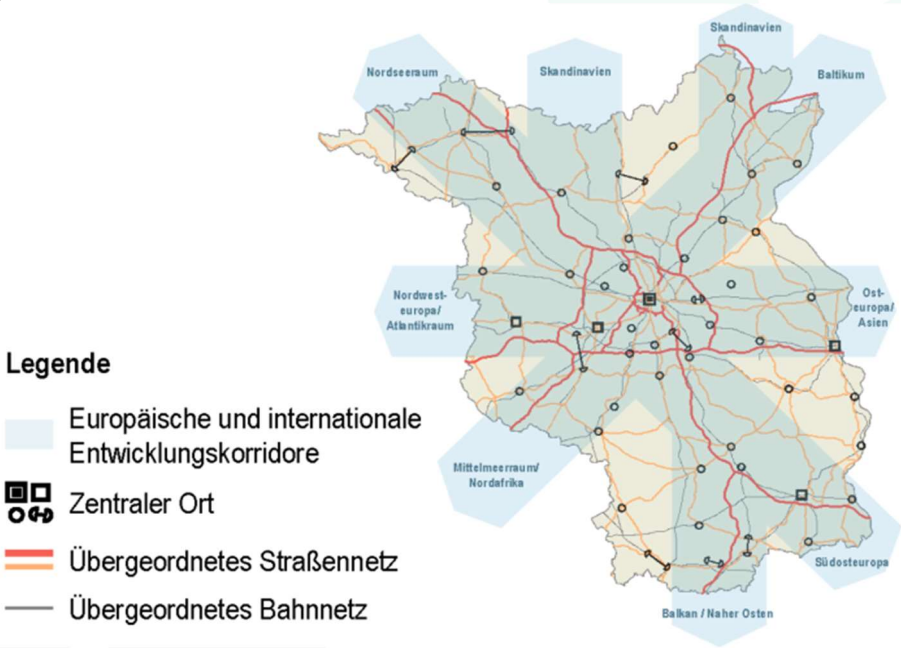


Figure 19 Transport corridors in Berlin (source Municipality of Berlin)

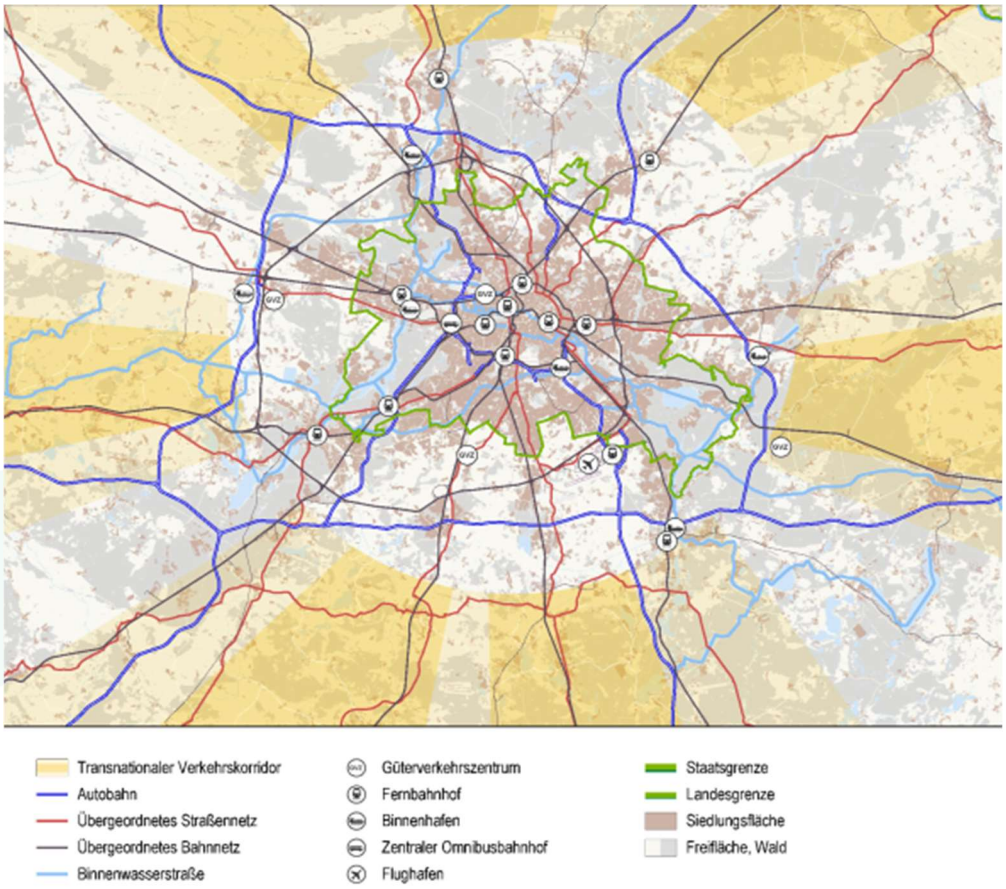


Figure 20 Road and rail networks and main transport infrastructures location in Berlin

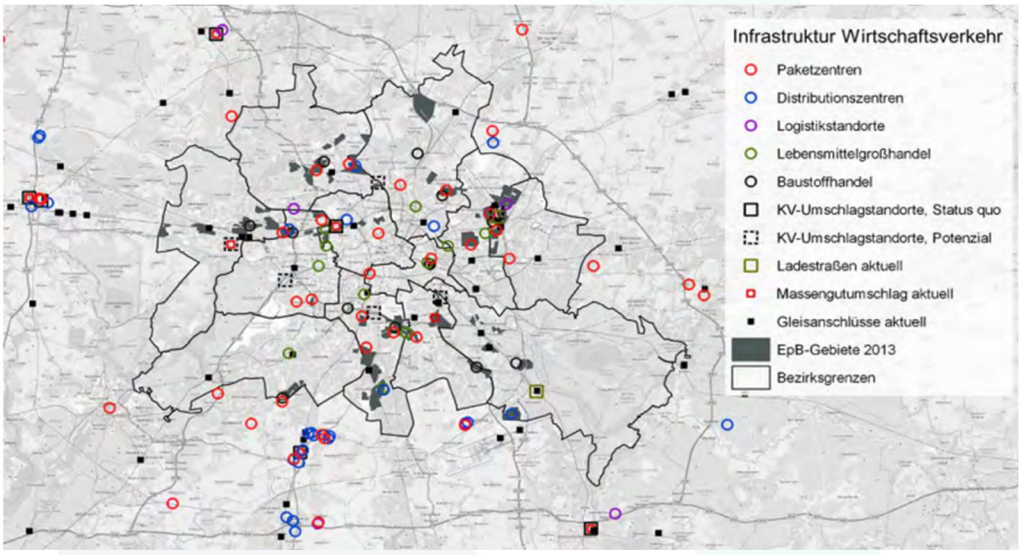


Figure 21 Freight transport infrastructure in Berlin

Prague, the capital of the Czech Republic, exhibits an uneven distribution of economic activities, with a concentration in its historic core. Road transportation dominates the city's logistics landscape, with trucks constituting 92% of goods movement. The city employs a hierarchical approach to traffic management, implementing a tiered system of truck

restrictions, diverting heavy trucks over 12 tons to the outer traffic road encircling the city, imposing restrictions on trucks over 6 tons in the broader city centre, and enforcing time-based limitations on vehicles over 3,5 tons in Prague's Historic Central District. Prague's logistical infrastructure includes various transportation nodes, but the primary challenge lies in balancing the preservation of historic areas with the need for efficient urban logistics.

The historical city of *Prague* exhibits a blend of old-world charm and modern logistics. The city leverages an extensive network of couriers, including DHL, PPL, FedEx, and UPS, for international logistics. Collaborations with retailers and industry associations promote sustainable urban logistics initiatives.

- *City Layout.* Prague's urban infrastructure is designed to support the movement of goods throughout the city, encompassing a network of roads, railways, airports, and intermodal facilities to cater to a diverse range of transportation needs. However, the city's central districts present challenges for road freight transport due to narrow streets and a dense urban environment.
- Prague's city layout is a testament to its history. The city is divided into several districts, each with its own character. The historic Old Town, Lesser Town, and Prague Castle complex feature narrow cobblestone streets, historic buildings, and iconic landmarks such as the Charles Bridge. These areas are not easily accessible to large vehicles, necessitating careful planning for urban logistics.
- *Historical Preservation.* Prague places a strong emphasis on historical preservation. Strict regulations protect its architectural heritage, influencing the city's logistical landscape. The preservation of historic buildings and landmarks limits construction and expansion opportunities, challenging the development of modern logistical nodes.
- *Transportation Hubs.* Prague's transportation hubs are essential logistical nodes. Václav Havel Airport Prague, the city's international airport, handles air cargo, with two terminals in the northern section of the airport capable of handling 200,000 tons of cargo annually. The Airport is well-connected to road and rail networks. The Port of Prague facilitates cargo transport along the Vltava River, while the city's central railway stations serve as critical points for freight transportation.
- *Road Networks*. The city's road network is a component of its logistical infrastructure. A series of highways and expressways connect Prague to other European cities, facilitating the movement of goods. However, within the city centre, the historic layout and narrow streets can pose challenges for larger vehicles.

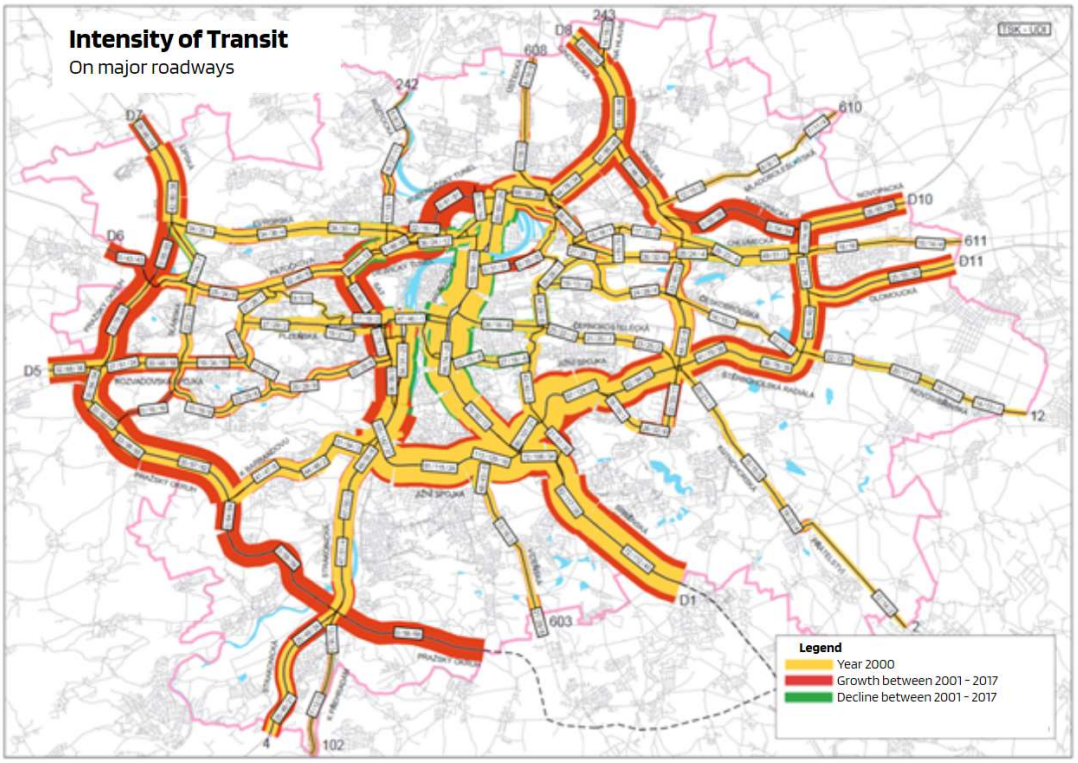


Figure 22 Traffic intensity in Prague's main roads (source Prague's City logistics analysis)

- *Warehousing and Distribution Centres:* Prague hosts various warehousing and distribution centres strategically positioned to serve the city and its surrounding regions. These facilities accommodate the storage and distribution of goods, helping meet the demands of the local population and businesses. Prague currently operates two micro-hubs for its cargo bike logistics industry, located in Florence and Smichov. Eight companies, including PPL, DHL, and DPD, participate in these sites. These micro-hubs facilitate the distribution of goods throughout the city via cargo bikes, contributing to sustainable delivery options. However, cargo bikes account for less than 1% of all commercial deliveries in Prague.

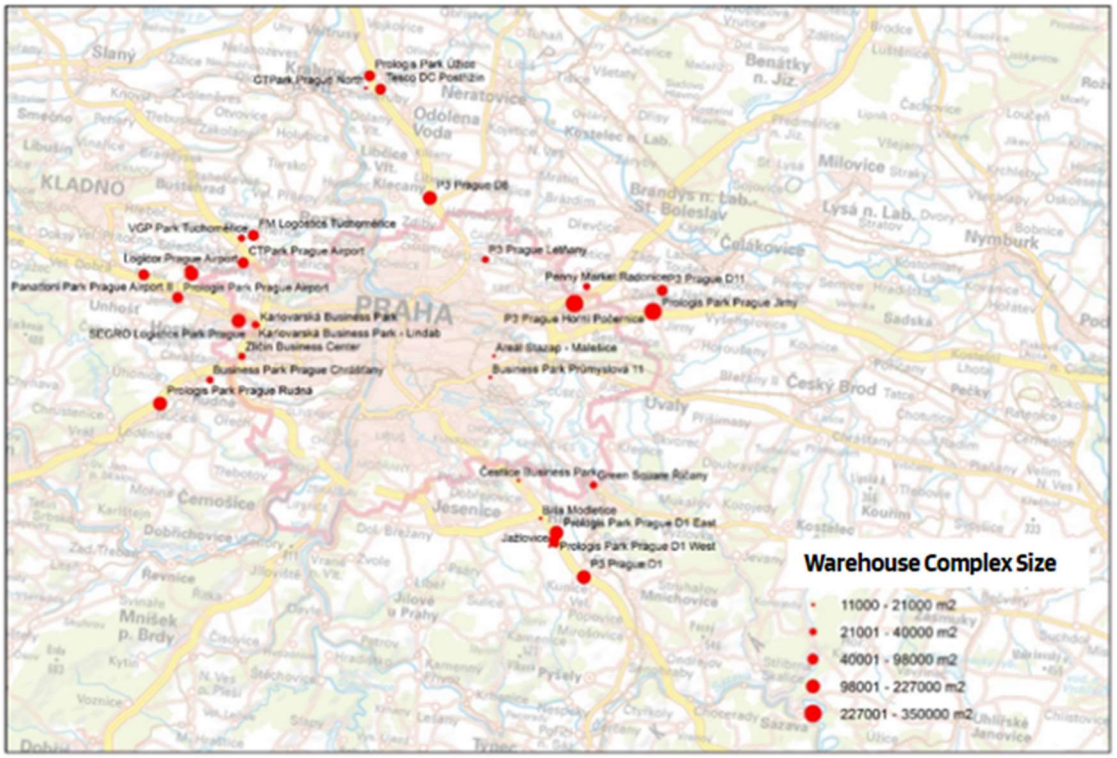


Figure 23 Main warehousing complexes in Prague and its surrounding area (source municipality of Prague)

Riga, the Latvian capital, boasts a diverse logistical landscape, driven primarily by road transportation. The city's strategic location along major transit routes contributes to its importance as a regional logistics hub. Key nodes include naval cargo centres overseen by the Freeport of Riga, railroad cargo centres managed by Latvian Railroads, and the cargo consolidation centre at Riga International Airport. These nodes facilitate efficient goods transfer and distribution.

- *Functional Urban Area (FUA*): Riga's FUA extends up to 100 kilometres from the city centre, serving as a hub for workplaces concentrated within the central city region. Daily commutes to the city are facilitated by private vehicles. It is important to note that Riga's municipal government lacks direct administrative control over the municipalities in the region. Instead, oversight of these areas falls under the purview of the Riga Planning Region institution, regulated by state ministries.

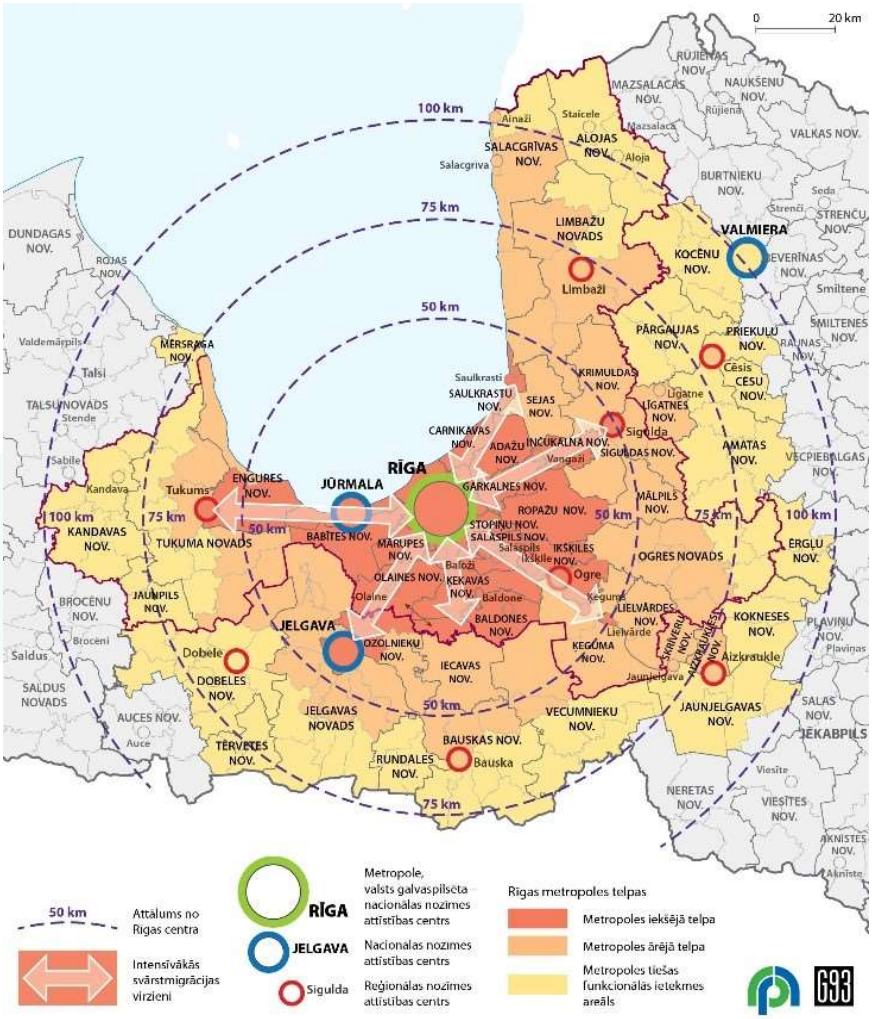


Figure 24 Riga's FUA (source municipality of Riga)

- *Logistical Nodes and Service Infrastructure*: Presently, Riga hosts cargo consolidation centres of national importance. These include naval cargo centres overseen by the Freeport of Riga, railroad cargo centres managed by Latvian Railroads and private entities, and Riga International Airport (RIX), equipped with cargo consolidation facilities catering to Latvian Post (Latvijas Pasts) and multiple private companies. These logistical nodes are primarily connected through road cargo transportation. Private logistics firms operating in Riga either have access to these large nodes or maintain their own warehouses within the city limits or in proximity to its borders. However, the city has yet to establish a dedicated urban logistics consolidation centre.
- *Industrial Zones*: Riga's industrial sites are scattered across various areas, including Bolderāja, Daugavgrīva, Mīlgrāvis, Vecmilgrāvis, Sarkandaugava, Kundziņsala, Pētersala-Andrejsala, Skanste (partially), Ķīpsala, Kleisti, Šķirotava, and Rumbula, forming a network of important logistical hubs.

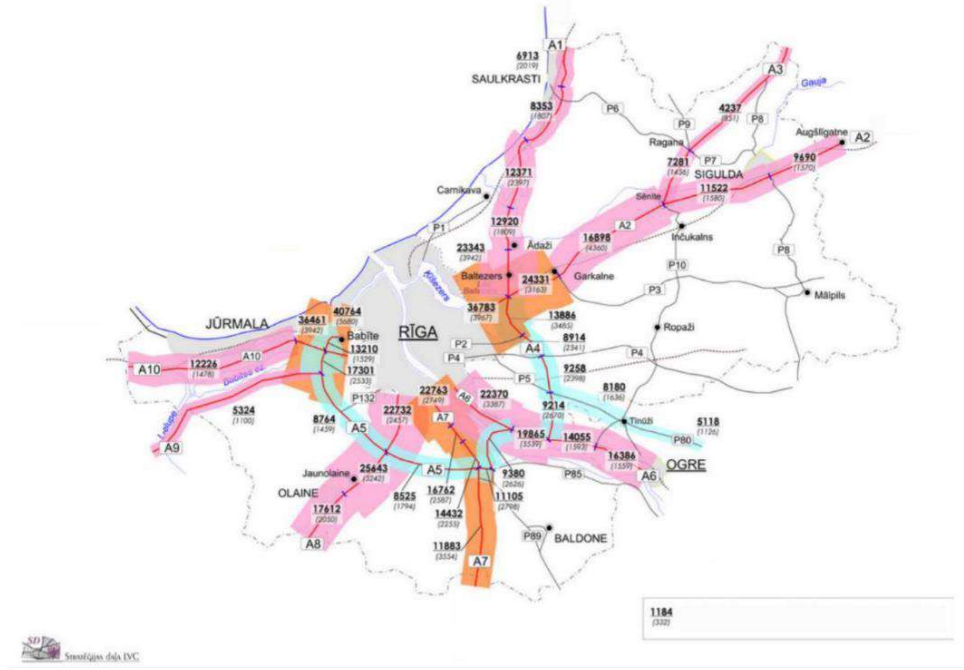


Figure 25 Annual average daily intensity on the key roads in Latvia, 2015 (source Riga's SECAP)

Funchal, situated on the island of Madeira, relies heavily on road transportation for urban logistics. Considering its size, the city lacks an urban logistics consolidation centre, which presents a challenge for optimizing freight movements. However, Funchal leverages technology, such as CCTV and parking sensors, to manage traffic and facilitate last-mile deliveries. These tools help maintain effective urban logistics operations, considering the city's geography. Due to the prevalence of micro logistics (more than 7%), local traders often use their vehicles for last-mile deliveries. However, Funchal lacks a dedicated logistics area within the city, leading to goods collection and delivery from external warehouses.

- *City Layout and Geography.* Funchal's urban landscape is characterized by a combination of coastal and mountainous terrain. The city extends from the shores of the Atlantic Ocean into the steep hillsides that surround it. This geographical layout has influenced the city's development, with the downtown area concentrated near the waterfront, gradually transitioning into residential neighbourhoods as it ascends the hills.
- *Logistical Nodes*:
  - Port of Funchal: The Port of Funchal is an important logistical node, serving as both a passenger and cargo terminal. It accommodates various types of vessels, including cruise ships, cargo ships, and fishing boats. The port facilitates the import and export of goods, especially those related to the island's thriving agricultural and tourism sectors.
  - Road Network: Funchal's road infrastructure connects its diverse neighbourhoods and supports the movement of goods within the city. The road system also provides

access to the island's interior regions, which are essential for the transportation of agricultural products.

- Funchal Airport (Madeira Airport): Located approximately 20 kilometres from the city centre, Funchal Airport serves as a transportation node. It handles both passenger and cargo flights, facilitating the movement of goods to and from the mainland and other international destinations.

- *Service Infrastructures:*

  - Marketplaces: Funchal features traditional markets like the Mercado dos Labradors, where local farmers and artisans sell fresh produce, fish, flowers, and handicrafts. These marketplaces are important for the distribution of locally sourced goods.
  - Warehousing Facilities: The city accommodates various warehousing facilities, primarily located near the port and industrial areas. These warehouses play a role in storing and distributing goods, ensuring a steady supply to businesses and consumers.
  - Retail and Commercial Centres: Funchal's city centre is home to numerous retail and commercial establishments, including supermarkets, boutiques, and specialty stores. These centres are essential for urban logistics, providing access to a wide range of products and services.
  - Road network: Funchal's logistical landscape faces challenges related to its topography, including limited space for expansion and steep gradients that can impact transportation efficiency.

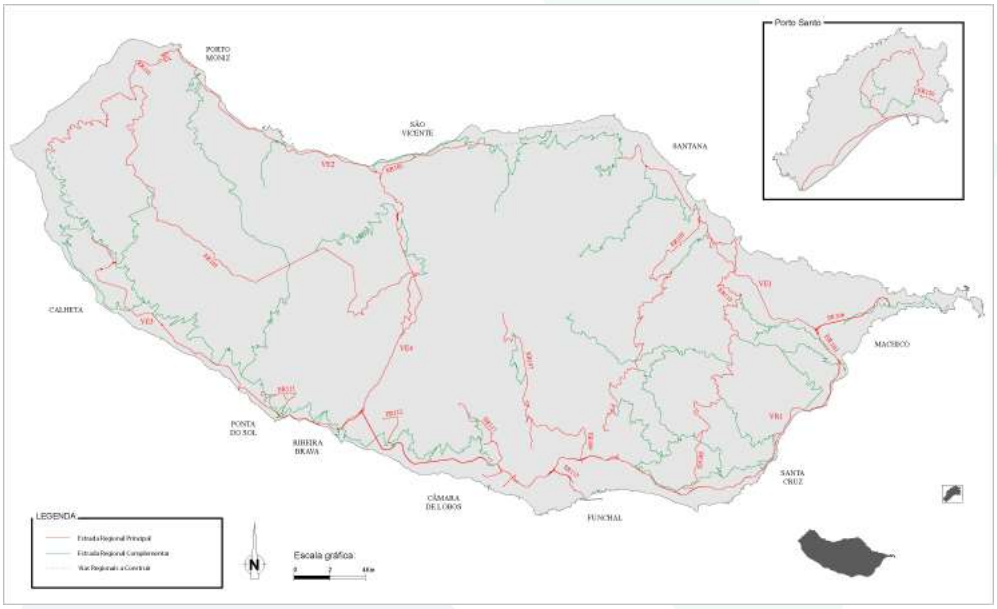


Figure 26 Madeira's regional road network (source Madeira's government18)

[18] https://www.madeira.gov.pt/drestradas/Estrutura/Rede-Vi%C3%A1ria-Regional

Mechelen, a compact Belgian city, enjoys a central location within the country's road network. Its proximity to major highways enhances accessibility for logistics providers. Warehouses at the city's periphery, like ODTH and CityDepot, offer consolidation points for efficient distribution. Despite its modest size, Mechelen has created an extensive network of cycling lanes, facilitating last-mile logistics operations via cargo bikes. The city's layout promotes sustainable urban logistics, reducing traffic congestion.

- *City Layout:* Mechelen's city layout is characterized by a well-preserved historic city centre surrounded by modern residential and industrial areas. The city centre features narrow streets and pedestrian zones, reflecting its heritage. This layout poses challenges for urban logistics, as it requires adapting to historical elements while accommodating contemporary transportation needs.
- *Logistical Nodes:* Mechelen is located at the intersection of major transportation routes in Belgium, making it a logistical node in the country. The city's logistical nodes include:

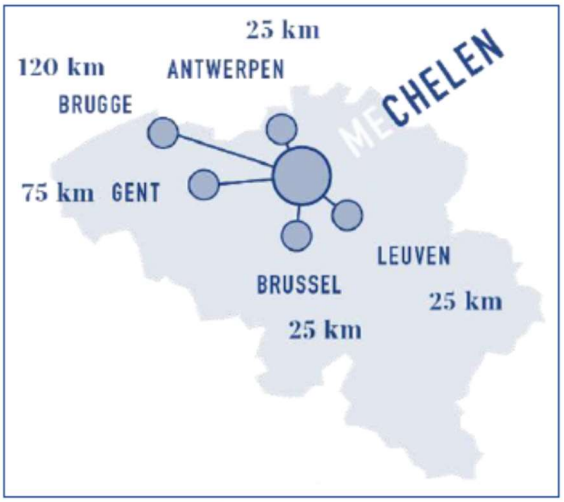


Figure 27 City of Mechelen and distance from the other Belgian cities

  - Ports (12,5%): Mechelen has access to several nearby ports, such as the Port of Antwerp and the Port of Zeebrugge, both of which facilitate maritime transportation. Goods arriving at these ports can be efficiently transported to Mechelen, thanks to its well-connected road and rail networks.
  - Rail Transport (10,25%): The Mechelen railway station is an important railway hub in Belgium. It connects the city to other Belgian cities and European destinations, making rail transport a mode for moving goods in and out of Mechelen.
  - Road Network (77,25%): Mechelen is intersected by major highways, including the E19 motorway, which connects Brussels and Antwerp. These roadways serve as essential conduits for the transportation of goods by trucks.
  - Canals: The city's proximity to navigable canals, such as the Brussels-Scheldt Maritime Canal, enhances its accessibility for inland waterway transport.

- *Service Infrastructures:* Mechelen offers a range of service infrastructures that support urban logistics operations:

  - Warehousing: The city features warehouses and distribution centres, both within its limits and in nearby industrial zones. These facilities are important for storing and sorting goods before distribution.

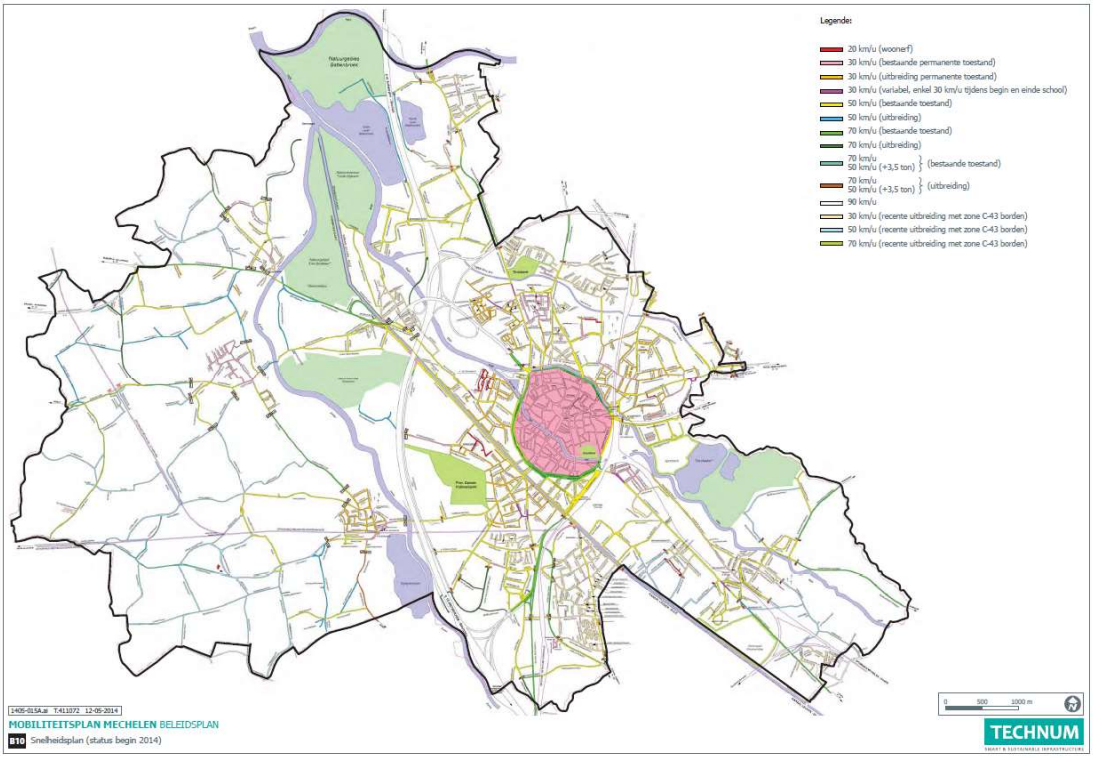


Figure 28 The road network in Mechelen according to the Speed plan (status early 2014; source Mechelen's SUMP)

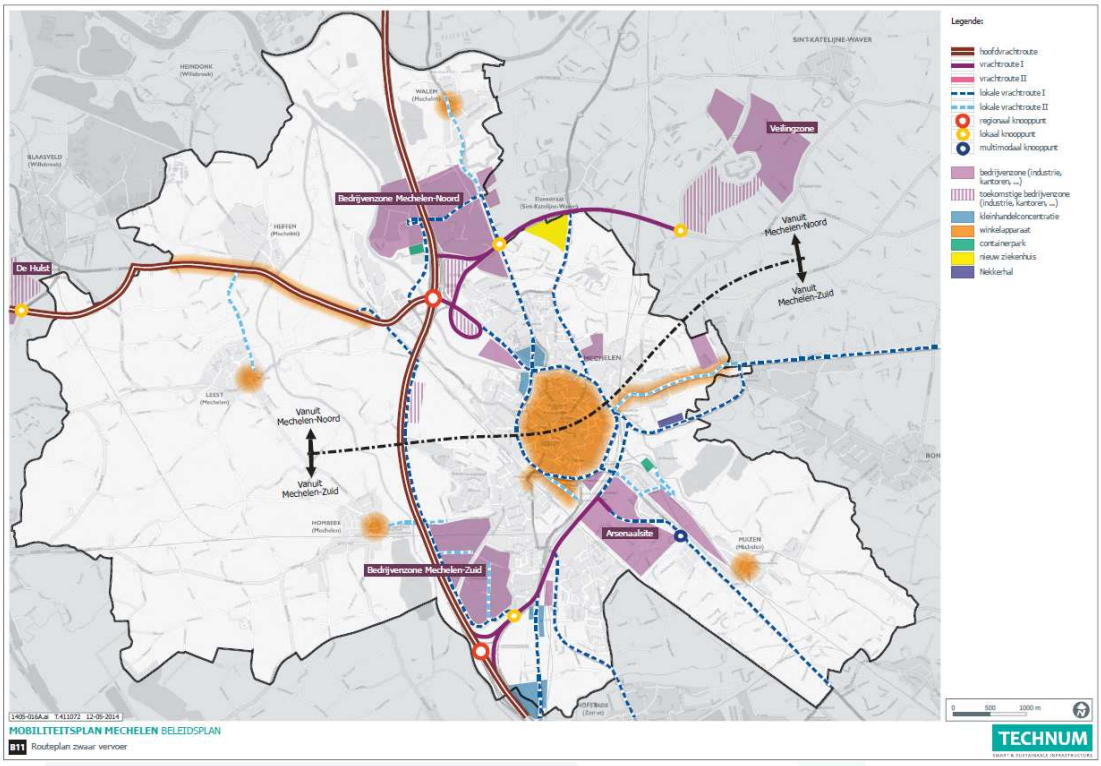


Figure 29Heavy transport route plan (source Mechelen's SUMP)

In comparing these cities, we observe a common emphasis on road transportation, reflecting the prevalence of trucks and vans in urban logistics. However, cities like Mechelen and

Florence prioritize sustainable solutions like cargo bikes and micro-hubs to reduce congestion and emissions. The existence of logistics nodes, whether naval, railroad, or airport-based, plays a critical role in facilitating efficient goods distribution, as seen in Riga. Each city's infrastructure reflects its commitment to balancing economic growth, environmental sustainability, and the quality of urban life through innovative logistical solutions.

4.2 ICT and technology systems

In today's dynamic urban logistics landscape, the integration of Information and Communication Technology (ICT) and advanced technology systems is a driving force behind enhancing the efficiency, sustainability, and responsiveness of supply chains; the collection of the above categories is very important in order to provide evidence to support the impact of these technologies. As we delve into the digital realm of Madrid, Florence, Berlin, Prague, Riga, Funchal and Mechelen, we discover how these cities harness technology to streamline their logistical operations.

Madrid addresses its urban logistics challenges with a focus on technology adoption. Smart traffic management systems help optimize traffic flow and reduce congestion. The city encourages the use of electric delivery vehicles to minimize environmental impact. Additionally, Madrid employs digital tools for route planning, tracking, and communication among logistics stakeholders.
Madrid, as a dynamic and forward-thinking city, has embraced Information and Communication Technology (ICT) and advanced technology systems to enhance its urban logistics, improve services, and streamline various aspects of urban life. The integration of these technologies plays a pivotal role in shaping the city's future and ensuring its competitiveness on the global stage.

- *Smart Reserve System*[19]*:* Madrid has introduced a Smart Reserve System for loading and unloading areas. This system, that has been running since summer 2022 and that is linked to a free App, provides real-time information on the availability of space for loading and unloading, enabling users to plan their logistics activities efficiently. By reducing indiscipline, such as unauthorized loading and unloading on streets, this system enhances orderliness, maximizes rotation, and optimizes operator routes. It represents a step towards streamlining urban logistics operations.
- *Digital Twins:* Madrid has explored the application of digital twins to optimize logistics operations, a promising initiative undertaken during the LEAD project. By creating digital twins of logistics networks and infrastructure, Madrid gains valuable insights into real-time operations, enabling better decision-making and resource allocation.

Florence stands out for its innovative use of technology to enhance urban logistics. The city embraces cargo bikes for last-mile deliveries and micro-hubs as consolidation points.

[19] https://www.madrid360.es/las-reservas-de-carga-y-descarga-inteligentes-llegan-a-madrid/

Additionally, advanced parking management systems are in place to optimize parking availability and streamline the logistics process. These technologies not only reduce congestion but also promote sustainability.

- *Smart City Control Room:* At the heart of Florence's technological advancements is the Smart City Control Room, a centralized hub that integrates various data sources and technologies to monitor and manage urban logistics and transportation systems. This control room serves as a nerve centre for real-time decision-making, allowing authorities to respond promptly to incidents, traffic conditions, and other logistical challenges.
- *Smart Services*: Florence offers a range of smart services designed to enhance urban mobility. These services include an extensive network of surveillance cameras and Wi-Fi hotspots strategically placed throughout the city. These cameras provide critical data on traffic flow, road conditions, and incident management. The availability of Wi-Fi enhances connectivity for residents and visitors, fostering a more connected and informed community.
- *IF App*: The IF App is a powerful tool that empowers users with up-to-the-minute information on various aspects of urban mobility. Users can access real-time updates on urgent roadworks, accidents, transit times for Local Public Transport (buses, trams, etc.), street cleaning schedules, cycle path availability, charging station locations, and parking space availability in the city. The IF App also supports access control systems, including the Limited Traffic Zone (ZTL) and the green shield zone, ensuring that users are informed and compliant with traffic regulations.
- *Metropolitan Traffic Monitoring*: Beyond the city limits, Florence has implemented a comprehensive traffic monitoring system covering regional roads. This system utilizes a network of cameras and sensors strategically placed along key routes. The FI-PI-LI App, a key component of this system, provides real-time traffic condition updates through a graphical representation. Road sections are color-coded (green, yellow, red, or black) based on information collected from sensors and webcams, enabling commuters to make informed decisions about their routes.

Berlin employs a range of technology systems to manage its bustling urban logistics scene. The city utilizes smart traffic management solutions, including restricted zones and low-emission areas. These systems help regulate traffic and mitigate environmental impacts. Berlin's diverse logistical landscape involves the use of digital platforms for route optimization and real-time tracking.

- One key element of Berlin's innovation ecosystem is its robust open data strategy. The city recognizes the transformative power of data and has made it a priority to make relevant information accessible to stakeholders. This approach fosters an environment of transparency and collaboration.
- One noteworthy component of Berlin's technological infrastructure is its long-standing Traffic Management Centre. This centre plays an important role in optimizing traffic flow and enhancing overall mobility within the city.
- Moreover, Berlin is at the forefront of exploring automated transport solutions, spanning public transportation, road freight, and waterway logistics. The city is

committed to harnessing the potential of automation to improve efficiency, reduce congestion, and lower environmental impacts.

- In addition to automation, Berlin is investing in decision support tools that empower city planners and logistics professionals to make data-driven decisions. These tools leverage real-time data and predictive analytics to optimize resource allocation, making the city's logistics ecosystem more responsive and adaptive.

Prague adopts various technology solutions to manage its urban logistics. The city employs advanced traffic management systems to balance the preservation of historical areas with efficient goods movement. ICT plays a significant role in monitoring traffic flows and enforcing restricted zones.

- *Digital Infrastructure:* Prague boasts a robust digital infrastructure, with widespread access to high-speed internet and mobile networks. This digital connectivity underpins various ICT applications and smart city initiatives, ensuring that residents and businesses can leverage digital resources effectively.
- *Parking Innovations*: Prague has introduced several innovative solutions to streamline parking within the city. In 2022, the Transport Company of the Capital City of Prague (TSK) launched a user-friendly parking information website called parking.praha.eu. This website not only provides valuable parking information but also serves as a portal for managing parking permits, gradually replacing the older parkujvklidu.cz platform. Additionally, the Litacka mobile app, initially designed for public transit fare payments, has expanded its functionality to include parking payments, offering a centralized platform for transportation-related transactions. There have been discussions about integrating a feature within the app that would enable logistics companies to reserve and pay for parking, simplifying logistics operations.
- *Parking Monitoring Vehicles*: Prague has taken parking monitoring to the next level by deploying specialized vehicles equipped to verify parking payments and assess parking occupancy. In 2022, the capabilities of these vehicles were extended to include the inspection of road defects such as potholes and issues with traffic signs. This enhancement accelerates the identification and rectification of road defects, contributing to safer and smoother goods transportation. *Open Data Platform*: Prague has adopted an open data platform that offers valuable transportation-related insights. The platform's Catalogue provides data on public transportation disruptions, timetables, vehicle accidents, public transportation and road shutdowns, the location and capacity of parking lots managed by the Technical Administration of Roads, annual statistics on public transportation, and the number of public transit tickets sold. This wealth of information empowers decision-makers, businesses, and the public, fostering transparency and informed decision-making in urban logistics and transportation planning.

Riga incorporates technology for real-time traffic monitoring and parking management. The city utilizes closed-circuit television (CCTV) cameras connected to a centralized platform to gather data on traffic activity, including vehicle counts, speeds, and types. Parking sensors deployed at various locations monitor parking occupancy and duration. Riga also deploys a

Long-Range Wide Area Network (LoRaWAN) to support smart parking solutions, enhancing overall urban logistics efficiency.

- Riga is in the early stages of implementing city-wide ICT technologies. Initiatives such as "CodingTheCurbs" aim to develop and pilot digital tools for managing delivery parking reservations in the RVC AZ region, particularly in areas like the Dzirnavu street and Krišjāņa Barona Street intersection. This pilot project is set to commence in Fall 2023.

Funchal utilizes technology to address its geographic challenges. The city employs traffic monitoring through CCTV systems, enhancing road safety and surveillance. Parking sensors provide valuable data on parking spot occupancy and usage times. Additionally, Funchal has invested in fiber optics to cover a wide area, facilitating data connectivity for urban logistics and other municipal services.

- *Real-time traffic monitoring system*, facilitated by a network of closed-circuit television (CCTV) cameras. These cameras are integrated into a centralized management platform, which compiles comprehensive data on traffic activity, including vehicle counts, speeds, and vehicle types. This system not only aids in congestion management but also provides valuable insights for optimizing urban logistics.
- *Parking sensors*. These sensors are strategically placed in various parking areas, encompassing loading and unloading zones, parking meters, and electric vehicle (EV) charging stations. They are seamlessly linked to a centralized management platform, offering real-time updates on parking occupancy and duration. This data not only assists residents and visitors in locating available parking spaces but also facilitates efficient goods delivery and servicing within the city.
- *LoRaWAN* (Long Range Wide Area Network) infrastructure, characterized by its extensive Wi-Fi range. This network seamlessly interfaces with parking sensors, enhancing data transmission efficiency and supporting smart city initiatives. Additionally, a robust fiber optic network has been deployed, covering a significant expanse of the municipality. This high-speed connectivity backbone ensures that Funchal remains at the forefront of technology adoption, facilitating the seamless exchange of data to urban logistics operations.

Mechelen leverages technology to promote sustainable urban logistics. The city utilizes automatic number plate recognition (ANPR) cameras to manage access to low-traffic zones efficiently. This technology aids in enforcing restrictions and facilitating smoother traffic flow in the city centre. Additionally, Mechelen has embraced cargo bikes for last-mile deliveries, harnessing the power of ICT for route optimization and real-time tracking.

While each city adopts technology and ICT solutions tailored to its context, common themes emerge. Real-time monitoring, data-driven decision-making, and sustainability considerations are at the forefront of these technological advancements. Whether through ANPR cameras, CCTV systems, or smart parking solutions, technology plays a pivotal role in shaping the future of urban logistics across Mechelen, Riga, Funchal, Prague, Florence, Berlin, and Madrid.

4.3 Stakeholders in urban logistics

Urban logistics is a complex web of interactions involving various stakeholders who play essential roles in shaping the delivery landscape of Mechelen, Riga, Funchal, Prague, Florence, Berlin, and Madrid.
In general, the key types of actors that participate in Urban logistics are:

- *Government Authorities*: This includes local, regional, and national government agencies responsible for transportation, urban planning, and environmental regulation. They provide the regulatory framework and infrastructure necessary for urban logistics.
- *Transportation Providers*: These are entities responsible for the actual movement of goods within the city. They can include logistics companies, courier services, freight carriers, and public transit agencies that provide freight services.
- *Businesses and Retailers*: Retailers, manufacturers, wholesalers, and e-commerce companies are essential stakeholders. They are the origin and destination points for goods, making their input crucial for efficient logistics planning.
- *Local Communities*: Residents, community groups, and neighbourhood associations are affected by urban logistics activities. Engaging them helps ensure that logistics solutions consider their needs and concerns, such as noise and air pollution.
- *Environmental and Sustainability Organizations*: Environmental groups and sustainability advocates play a role in promoting green logistics practices. Their input can help align urban logistics with sustainability goals.
- *Technology and Innovation Partners*: Companies developing logistics technology, such as route optimization software or electric vehicle manufacturers, can contribute to innovative solutions for urban logistics challenges.
- *Academic and Research Institutions*: Universities and research organizations often conduct studies and provide data and expertise on urban logistics. They contribute to evidence-based decision-making.
- *Transport Associations*: Associations representing the transport and logistics industry can provide valuable insights and represent the interests of their members in discussions on urban logistics policies.
- *Community Representatives*: Including representatives from diverse communities, such as disability advocacy groups or senior citizen associations, ensures that logistics solutions are inclusive and accessible to all.
- *Emergency Services*: Police, fire, and medical services need efficient logistics for their operations. Inclusion of these services in planning can enhance overall urban logistics resilience.
- *Regulatory and Permitting Bodies*: Agencies responsible for issuing permits and enforcing regulations related to urban logistics, such as parking permits and delivery time restrictions, are essential stakeholders.
- *Non-Governmental Organizations (NGOs)*: NGOs focused on urban development, transportation, or social welfare can provide a broader perspective on logistics impacts and solutions.

- *Chambers of Commerce and Trade Associations*: These organizations represent the interests of local businesses and can advocate for logistics solutions that support economic growth.

Understanding the key actors in UNCHAIN cities is crucial for comprehending the intricate dynamics of urban logistics.
It could be anticipated that challenges in the active collaboration between stakeholders and public authorities could be overcome by the establishment of permanent working groups and specific agreements, especially regarding data management and exchange.

Madrid, as Spain's central logistics hub, involves multiple stakeholders. Couriers like Correos and SEUR deliver parcels, while associations like UNO and AECOC drive industry standards. Collaborations with urban mobility startups and local governments highlight Madrid's commitment to modernizing its logistics landscape.
The efficient functioning of urban logistics in Madrid is a collaborative effort involving a diverse group of stakeholders. These stakeholders play pivotal roles in shaping the city's logistics landscape, ensuring the smooth flow of goods and services, and addressing the challenges posed by a bustling metropolis like Madrid.
Key stakeholders:

- *Public Authorities and Municipal Government:* At the heart of urban logistics governance in Madrid is the Municipal Government. Responsible for city planning, infrastructure development, and regulatory frameworks, it sets the stage for logistics operations.
- *Businesses and Retailers*: Private companies, ranging from local businesses to multinational retailers, are essential stakeholders in Madrid's urban logistics ecosystem.
- E-commerce Giants: Companies like Amazon, El Corte Inglés, and local retailers have embraced e-commerce and employ advanced logistics solutions for last-mile delivery.
- *Transportation and Logistics Providers*: Transport and logistics companies (such as DHL, partner in this consortium) are at the core of Madrid's logistics network.
- *Industry Associations and Non-Governmental Organizations (NGOs*): Various industry associations, such as the Spanish Logistics and Transport Association (UNO), advocate for best practices and collaborate with government bodies. NGOs, like environmental organizations, focus on sustainable logistics and influence policy development.
- *Academic and Research Institutions*: Madrid's universities and research centres contribute to logistics advancements through research, education, and collaboration with stakeholders. They provide insights into emerging trends and sustainable practices.

In the heart of Tuscany, **Florence** seamlessly blends historic charm with modern logistics. Couriers like Bartolini and SDA, along with e-commerce platforms, ensure efficient parcel deliveries. Local retailers in the historic city centre collaborate through associations, and the city benefits from academic expertise, primarily from the University of Florence.

- Public key Stakeholders:

- *Local Government:* Florence's local authorities are responsible for urban planning, infrastructure management, and transportation policies.
- *Other Municipalities in the Metropolitan Area:* Coordination with neighbouring municipalities is essential for seamless goods movement in the region.
- *Regional Authority:* The regional government plays a role in shaping logistics policies and regulations.

- Delivery Companies:
  - *Logistics Companies:* Local and international logistics firms, such as GLS, Bartolini, Apice Firenze, Toscana Logistica Service, FedEx, TNT Rxpress, DHL, UPS (partner in the consortium) and others, are instrumental in facilitating goods movement.
  - *E-commerce Giants:* Companies like Amazon, Coop, Esselunga, SDA Express Courier, and more, are central to the e-commerce supply chain, making timely deliveries to customers.
- Infrastructure and Service Management Companies:
  - *Autostrade per l'Italia:* Managing the highway network, Autostrade plays a role in the regional and national transportation network.
  - *Tuscany Airports Florence:* Ensuring efficient air cargo operations at Florence's airports.
  - *State Railways Group:* Responsible for rail freight transportation, particularly relevant for intermodal logistics solutions.
- HORECA and Retailers:
  - *Hospitality Industry (HORECA):* Restaurants, hotels, and catering services rely on timely deliveries of food and supplies.
  - *Retailers:* Local shops and large retailers like supermarkets depend on efficient logistics to restock their inventory.

Berlin hosts a diverse range of logistics stakeholders. International couriers like DHL, DPD, and GLS operate alongside local players. Industry associations, including IHK Berlin and the German Logistics Association (BVL), shape the logistics landscape. Berlin's commitment to sustainability is evident through collaboration with environmental organizations and electric vehicle initiatives.

- Key Stakeholders: At the city level, Berlin's governance structure is marked by two tiers of administration. The "Senatsverwaltungen" function as ministries, while the "Bezirke" represent districts with autonomy and power. Although logistical strategies are often devised at the higher administrative level, the districts play essential roles in shaping local logistics.
- Important stakeholders in Berlin's logistics landscape include the Berliner Hafen und Lagerhausgesellschaft (BEHALA), a private company owned by the city, overseeing the Port of Berlin (Westhafen). Public transport companies, such as BVG and S-Bahn Berlin, ensure efficient urban mobility. The Berliner Stadtreinigung (BSR) is responsible for waste management, contributing to Berlin's sustainability and cleanliness.

- Transportation Landscape: Berlin's transportation landscape reflects its vibrant economic activity. In 2020, the city saw an impressive fleet of 106,639 registered trucks and 6,707 trailers, with a notable increase in recent years. Diesel and gasoline remain dominant as fuel types, although alternative fuels gain traction, particularly among lighter vehicles.

Urban logistics in **Prague** involves a complex network of stakeholders, each playing a role in shaping the city's transportation and supply chain landscape. These stakeholders collaborate and interact to ensure the efficient movement of goods and services throughout the metropolitan area.

- Demand Ket Stakeholders:
  - *Private Consumers:* The rise of online shopping has significantly increased the demand for urban logistics services, as more consumers expect timely and reliable deliveries to their doorsteps. This growing trend places added pressure on the urban logistics industry to meet the expectations of private consumers.
  - *Retailers:* Prague features a high concentration of retail units, especially within the Prague Conservation Area (PPR), characterized by its narrow streets. The need to supply these retail units often leads to parking challenges, particularly in historic parts of the city. Retailers play a role in shaping the logistics landscape, and their requirements influence the design of logistics solutions, including parking facilities.
  - *HORECA (Hospitality Industry):* Prague's vibrant hospitality industry relies on efficient logistics for the timely delivery of goods, including food and beverages, to restaurants, hotels, and cafes. The demand from HORECA establishments contributes to the complexity of urban logistics in Prague.
  - *Manufacturers and Suppliers*: Manufacturers and suppliers are key contributors to the demand for urban logistics services. They require effective supply chain solutions to transport raw materials, components, and finished products to and from their facilities.
  - *Government and Public Sector:* The government and public sector, including government-funded hospitals, have specific logistics needs. For example, pharmacies that are part of government-funded healthcare institutions require a consistent supply of medications and medical supplies. Meeting these demands efficiently is important for public health.
- Offer:
  - *Truckers:* Trucks play a role in Prague's logistics landscape, accounting for a substantial portion of goods transportation to and from the city. As e-commerce continues to grow, the role of truckers is expected to expand further. Ensuring the smooth flow of truck traffic is essential for the effective functioning of urban logistics.
  - *E-commerce Platforms:* Major e-commerce players like Alza.cz and the Mall Group are central to the logistics ecosystem. Collaboration with e-commerce platforms can lead to innovative logistics solutions, especially as online shopping becomes increasingly prevalent.

- *Independent Carriers:* Independent carriers form a part of the logistics offer, providing last-mile delivery services and flexible transportation options.
- *Logistic Public & Private Companies:* Logistic companies, both public and private, are key players in the urban logistics industry. They offer a wide range of services, including warehousing, transportation, and distribution, contributing to the city's logistics infrastructure.

- Regulators:

  - *Prague City Hall, Transportation Department: T*he Transportation Department plays a critical role in shaping urban logistics policies and regulations. They are responsible for managing transportation infrastructure and addressing logistical challenges within the city.
  - *City Police:* The city police enforce traffic and parking regulations, ensuring compliance with road safety and parking rules. Their actions help maintain order and safety on Prague's streets.
  - *Technical Administration of Roads (TSK):* TSK manages and maintains the road infrastructure in Prague. They play an important role in monitoring road conditions and addressing road defects, including potholes and traffic signs.
  - *Institute for Planning and Development (IPR):* IPR collects and analyses data related to transportation and traffic, contributing to informed decision-making regarding urban logistics.
  - *Prague Public Transit Company (DPP):* DPP manages the city's public transportation systems, including metro, buses, trams, and regional buses. Coordinating logistics to minimize disruptions to public transit is essential for efficient urban logistics.
  - *Regional Organiser of Prague Integrated Transport (ROPID):* ROPID collects and analyses data regarding public transportation and traffic. Their insights are valuable for optimizing logistics operations.

- Service Providers:

  - *ICT Operator:* Golemio manages Prague's data platform, which plays an important role in evaluating and interpreting urban data. This platform supports various stakeholders, including logistics companies, in making informed decisions.

Riga, being a logistics gateway in the Baltic region, urban logistics in Riga is a multifaceted ecosystem shaped by a diverse array of stakeholders, each playing an important role in the city's supply chain management and transportation infrastructure. These stakeholders encompass demand-side entities, service providers, regulatory bodies, and organizations actively engaged in shaping the future of logistics in the Latvian capital.

- Demand-Side key Stakeholders:

  - *Private Consumers*: The city's residents, representing a spectrum of needs and preferences, are a fundamental component of urban logistics demand. Their consumption patterns, from e-commerce shopping to grocery deliveries, significantly influence logistics operations.

- *Retail and Service Businesses*: Local shops, supermarkets, restaurants, and service providers depend on efficient urban logistics to stock inventory, receive goods, and fulfil customer orders.
- *Offices*: The business district of Riga relies on logistics services for office supplies, equipment, and other essentials necessary to maintain daily operations.
- *Municipal Planning Institutions*: Municipal authorities and urban planners play a role in shaping the logistical landscape of Riga. They are responsible for zoning regulations, infrastructure development, and sustainability initiatives that impact logistics.
- *Politicians*: Elected officials influence urban logistics policies and initiatives through legislation and advocacy efforts aimed at improving the efficiency and sustainability of the supply chain.

- Supply-Side key Stakeholders:
  - *Private Logistics Businesses*: Private logistics companies operating within Riga provide a wide range of services, including last-mile delivery, warehousing, and freight transportation.
  - *Associations of Businesses in Logistics*: Industry associations facilitate collaboration among logistics companies, address common challenges, and promote best practices.
  - *Non-Governmental Organizations (NGOs)*: NGOs often partner with start-ups and technology providers to innovate and improve logistics services while addressing societal and environmental concerns.
  - *ICT Service and Data Providers*: Technology companies offer essential tools and solutions for optimizing logistics processes, such as route planning, tracking, and data analytics.

- Regulatory key Stakeholders:
  - *Municipal Government*: Riga's local government plays a central role in regulating urban logistics, including issues related to parking, zoning, and the implementation of sustainable transportation solutions.
  - *National Government*: Latvia's national government influences logistics policies and regulations that affect Riga, ensuring alignment with national objectives.
  - *Administrative Regulations*: Compliance with national and local administrative regulations is essential for logistics providers, impacting everything from vehicle emissions to safety standards.

- Service Providers:
  - *Private Parking Managers*: Companies specializing in parking management provide essential services for the efficient flow of delivery vehicles within the city.
  - *Waste Managers*: Waste collection and disposal services are critical components of urban logistics, ensuring the timely removal of waste and recycling materials.

- Traffic Services Providers: Organizations responsible for traffic management and congestion reduction contribute to efficient urban logistics by optimizing transportation routes.
- *Postal and Courier Services*: Postal companies and courier services handle the delivery of letters, packages, and parcels, serving both businesses and individuals.
- *Police*: Law enforcement agencies play a role in regulating and ensuring compliance with traffic and safety regulations in the city's logistics sector.

On the island of **Madeira**, Funchal relies on various stakeholders to manage its urban logistics. The Associação de Comércio e Industrial do Funchal (ACIF-CCIM), representing commerce and industry, plays a pivotal role. Freight operators, including those in the HORECA, goods, waste management, retail, and postal sectors, are key players. The police are responsible for enforcement and road code compliance in parking use.
Key Stakeholders:

- *ACIF-CCIM (Associação de Comércio e Industrial do Funchal):* The Commerce and Industrial Association of Funchal serves as a prominent representative of the logistics sector. ACIF-CCIM plays a role in advocating for the interests of businesses engaged in logistics operations. This association acts as a liaison between the logistics industry and local authorities, fostering cooperation and dialogue to address challenges and implement innovative solutions. ACIF-CCIM's active involvement contributes to the sustainability and growth of Funchal's logistics sector.
- *Freight Operators*: Freight logistics in Funchal encompass a diverse range of activities, from hospitality and retail to waste management and postal services. Various entities, including HORECA establishments, goods suppliers, waste management companies, retailers, and postal service providers, form the backbone of freight operations. These freight operators are responsible for the movement and distribution of goods within the city. Their efficient and coordinated efforts are essential to meet the demands of Funchal's residents and businesses. Collaboration among these operators is pivotal for ensuring timely deliveries, reducing congestion, and minimizing environmental impact.
- *Police*: The local police force in Funchal plays a critical role in enforcing regulations related to urban logistics. Their efforts are instrumental in preventing congestion, ensuring road safety, and promoting efficient logistics practices.
- *Local Businesses and Residents*: While not specific entities, local businesses and residents are indispensable stakeholders in Funchal's urban logistics. Businesses rely on efficient logistics to receive supplies, stock inventory, and fulfil customer orders. Residents depend on reliable deliveries for essential goods and services. Their active participation, support for sustainable logistics practices, and feedback are important for shaping the city's logistics policies and ensuring that the urban logistics ecosystem aligns with the needs and expectations of the community.

In the Belgian city of **Mechelen**, primary stakeholders include courier companies like ECOkoeriers and international giants like UPS Limited. Collaboration between these courier services and local businesses, represented by interest groups such as Horeca Vlaanderen and

Febetra, is essential. Additionally, academic organizations like VUB-MOBI, University of Antwerp, contribute their expertise to the city's logistics development.
Key Stakeholders:

- *City Authorities*: Mechelen's municipal government plays a central role in urban logistics management. City authorities work to balance the needs of residents, businesses, and logistics providers to create a harmonious urban environment.
- *Logistics Companies*: Private logistics companies are essential stakeholders in Mechelen's urban logistics landscape. These companies often collaborate with the city to adhere to regulations and explore innovative solutions for sustainable urban logistics.
- *Residents:* Mechelen's residents are key stakeholders as they directly experience the effects of urban logistics. They rely on deliveries for various goods, making their input valuable in shaping city policies. Resident feedback helps address concerns related to traffic, noise, and air quality, promoting a higher quality of life.
- *Businesses:* Local businesses in Mechelen, from small retailers to large enterprises, clustered on Mechelen Meemaken vzw groupation, rely on urban logistics for their supply chains. They work closely with logistics providers to optimize deliveries and inventory management. Additionally, they engage with the city to ensure that logistics processes align with their operational needs.

In summary, stakeholders in urban logistics encompass a wide spectrum, including courier services, retailers, interest groups, academic institutions, and industry associations. These actors collaborate to ensure efficient, sustainable, and customer-centric delivery solutions within their respective urban environments. Their interactions and partnerships are instrumental in defining the success of urban logistics systems in Madrid, Florence, Berlin, Prague, Riga, Funchal and Mechelen.

4.4 Transportation in urban logistics

Transportation is the lifeblood of urban logistics, and each of the seven cities— Madrid, Florence, Berlin, Prague, Riga, Funchal and Mechelen —adopts a distinct approach to move goods efficiently within their urban environments.

Madrid promotes electric delivery vehicles to reduce emissions and traffic congestion. Its road infrastructure supports efficient urban logistics, while smart traffic management systems optimize the flow of goods. Couriers like DHL, DPD, FedEx, and BPS Distri are instrumental in goods distribution.
The transportation system in Madrid is the lifeblood of urban logistics, enabling the movement of goods throughout the city and ensuring the continuous supply of products to its residents and businesses. Madrid's strategic location, extensive road network, and evolving transportation infrastructure play a pivotal role in facilitating urban logistics operations.

- *Road Network*: Madrid boasts an extensive network of roads and highways, including the M-30, M-40, and M-50 ring roads, which encircle the city and connect it to other major routes in Spain and Europe. This road infrastructure allows for the efficient transit of goods both within the city and to neighbouring regions.
- *Public Transit*: The city's public transportation system, managed by the Madrid Municipal Transport Company (EMT), consists of buses and the Madrid Metro. While primarily focused on passenger transport, these systems indirectly support logistics by facilitating the mobility of workers, including those in the logistics industry.
- *Rail and Intermodal Transportation*: Madrid's strategic location in Spain makes it a major railway hub. The city is connected to an extensive rail network, enabling the efficient movement of freight by train. The Madrid Atocha and Madrid Chamartín railway stations are key points of access for goods entering or leaving the city.
- *Air Cargo*: Adolfo Suárez Madrid-Barajas Airport, one of Europe's busiest airports, serves as an important gateway for air cargo. The airport features dedicated cargo terminals and facilities, handling a wide range of goods, including perishables, electronics, and pharmaceuticals. Air cargo transportation is particularly important for time-sensitive and high-value shipments.
- *Last-Mile Delivery:* Last-mile delivery is a critical component of urban logistics, ensuring that goods reach their final destinations within Madrid. To address congestion and environmental concerns, various solutions have emerged:
  - Electric Vehicles: Many logistics companies are transitioning to electric vehicles for last-mile delivery, reducing emissions and noise pollution.
  - Cargo Bikes: Cargo bikes are increasingly used for efficient and eco-friendly urban deliveries, especially in congested areas.
  - Micro Hubs: Micro distribution hubs located within the city help optimize last-mile delivery routes, reducing delivery times and emissions.
- *Sustainability Initiatives:* Madrid is committed to sustainability in urban logistics. Initiatives include promoting the use of electric vehicles, implementing low-emission zones, and incentivizing sustainable transportation practices. These efforts align with European goals for reducing carbon emissions in urban areas.

Florence utilizes cargo bikes and eco-friendly vehicles for inner-city deliveries to reduce environmental impact. Road transportation is essential for connecting with surrounding areas. The city focuses on collecting transportation data to improve logistics efficiency.

- *Historic Street Layout*: One of Florence's defining features is its historic street layout. Narrow, winding roads designed centuries ago were not intended for modern transportation needs. This poses a challenge for the movement of goods, especially for larger vehicles. Restrictions on the size and weight of vehicles entering the city centre aim to preserve its architectural heritage but also necessitate careful planning for deliveries.
- *Limited Traffic Zone (ZTL):* Florence's ZTL is designed to reduce traffic congestion and protect historic areas. It restricts access to unauthorized vehicles during certain hours. While this initiative enhances the quality of life for residents and preserves the city's

charm, it creates logistical hurdles. Delivery companies must adapt schedules to adhere to ZTL regulations, often conducting deliveries during early morning hours or late at night.

- *Public Transportation and Multimodal Solutions*: Florence boasts an extensive public transportation system, including buses and trams. To reduce traffic congestion and emissions, stakeholders are increasingly exploring multimodal solutions. These may involve using electric cargo bikes for last-mile deliveries, coordinating with public transport for freight, and leveraging river transport along the Arno River for bulk cargo movement.
- *Innovative Delivery Methods:* E-commerce growth has prompted innovation in delivery methods. Electric delivery vehicles and cargo bicycles have gained popularity for their eco-friendly profiles and manoeuvrability through narrow streets. Drone delivery trials have also been conducted, offering the potential for quick and efficient deliveries to select locations.
- *Tourism-Driven Logistics*: As a major tourist destination, Florence experiences seasonal fluctuations in logistics demand. The tourism sector requires efficient deliveries to hotels, restaurants, and gift shops. Coordinating these logistics with tourism activities while preserving the visitor experience is an ongoing challenge. Digital platforms that provide real-time information on tourism trends and logistics needs can aid in this effort.

Berlin places great emphasis on eco-friendly logistics, encouraging electric delivery vehicles. Its extensive road network supports urban logistics, with global courier services handling goods distribution. The city leverages technology for traffic management and data collection. Transportation Landscape: Berlin's transportation landscape reflects its vibrant economic activity. In 2020, the city saw an impressive fleet of 106.639 registered trucks and 6.707 trailers, with a notable increase in recent years. Diesel and gasoline remain dominant as fuel types, although alternative fuels gain traction, particularly among lighter vehicles.

Prague boasts an extensive road network, enabling efficient road transportation. Couriers like DHL, PostNL, DPD, FedEx, and BPS Distri utilize these roadways for deliveries. Prague's transportation infrastructure includes an array of roads and tunnels to facilitate logistics.
Transportation plays a pivotal role in Prague's urban logistics ecosystem, facilitating the movement of goods and services across the city's diverse landscape. Prague's transportation system comprises various modes of transit and infrastructure, contributing to the efficiency and sustainability of urban logistics.

- *Public Transportation Network*: Prague boasts an extensive and well-connected public transportation system managed by the Prague Integrated Transport (PID) agency. This system includes trams, buses, the metro, and ferries, providing residents and businesses with accessible, reliable, and eco-friendly mobility options. The public transit network is a component of urban logistics, supporting the movement of passengers and facilitating the last-mile delivery of goods.
- *Road Infrastructure*: Prague features a comprehensive road network, including highways, main roads, and local streets. These roads enable the efficient flow of goods within the city and connect Prague to national and international transportation routes. The city continually invests in road infrastructure improvements, such as road

expansion, maintenance, and congestion management, to enhance urban logistics efficiency.

- *Cycling and Pedestrian Infrastructure*: Prague is committed to promoting sustainable transportation modes, including cycling and walking. The city has invested in dedicated bike lanes, pedestrian-friendly streets, and bike-sharing programs. These initiatives support eco-friendly last-mile deliveries, reduce traffic congestion, and contribute to a healthier urban environment.
- *Freight Transportation*: Freight transportation in Prague involves a mix of delivery vehicles, ranging from vans and trucks to cargo bicycles. Urban logistics providers utilize modern fleet management technologies to optimize routes, reduce delivery times, and enhance operational efficiency. Additionally, Prague's strategic location in Europe facilitates the movement of goods through international rail and road networks.
- *Last-Mile Delivery Challenges*: Like many urban centers, Prague faces last-mile delivery challenges, including traffic congestion, parking limitations, and increasing demand for e-commerce deliveries. Stakeholders collaborate to find solutions, such as designated delivery zones, delivery lockers, and off-peak delivery times, to alleviate these challenges.

R*iga*, situated near the Baltic Sea, capitalizes on its waterways for transport, with a portion of cargo moved by sea. Road transportation is also important, with various courier services and cargo vehicles facilitating goods distribution. Riga's warehouses are important nodes for cargo consolidation.

- *Road Network:* Riga features an extensive road network, facilitating the movement of goods within the city and connecting it to neighbouring regions. This network is important for last-mile delivery services and the transportation of goods to and from warehouses.
- *Port Facilities:* Riga is home to the Freeport of Riga, which operates as a naval cargo centre. This facility handles the import and export of goods via maritime transportation, contributing significantly to the city's logistics capabilities.
- *Railway Connections:* The Latvian Railroads (Latvijas Dzelzceļš), both state-managed and private, provide railway cargo centres in various parts of the city. These rail connections are important for transporting goods efficiently, especially those connected to the port area.
- *Riga International Airport (RIX):* The airport serves as a hub for air cargo transportation, accommodating Latvian Post (Latvijas Pasts) and multiple private companies. This facility facilitates the rapid movement of time-sensitive goods.
- *Freight Transportation*: There are three main types of urban logistics service vehicles in Riga: vans, regular cars and cargo bicycles.
  - Vans are mostly used by Latvian Post and service providers, who deliver packages, groceries, and some other household items.
  - Cargo bicycles are used by one service provider (Velokurjers.lv), who partners with other businesses to deliver different letters and small-size goods.

- Regular size cars are used by businesses who deliver office goods and household goods.
- Middle to large size cargo vehicles used to provide goods to businesses which require stocking deliveries.

In **Funchal**, goods are primarily transported by road due to its island location. The absence of logistic areas within the city results in local traders handling the last mile using their vehicles. The city has embraced technology for real-time traffic monitoring and parking management.

- *Road Network*: Funchal's road network is characterized by winding, narrow streets that traverse the city's hillsides. While these roads add to the city's charm, they can also present challenges for urban logistics, particularly for large vehicles and delivery trucks. To mitigate congestion and improve traffic flow, the city has implemented intelligent traffic management systems, including real-time monitoring and adaptive traffic signals.
- *Port of Funchal*: The Port of Funchal, situated along the city's coastline, serves as a logistical node for maritime cargo and passenger transportation. It connects Funchal to other Portuguese cities and international destinations, facilitating the import and export of goods. The port's cargo handling facilities contribute to the efficient movement of products, while cruise ship terminals cater to the city's vibrant tourism industry.

Mechelen primarily relies on cargo bikes and eco-friendly vehicles for last-mile deliveries, emphasizing sustainability. Its city centre proximity to highways ensures efficient road transportation, while warehouses like ODTH and CityDepot play key roles in consolidating goods for distribution.

Mechelen's transportation infrastructure is a critical component of its urban logistics system, enabling the efficient movement of goods throughout the city while addressing environmental concerns and improving overall quality of life. Here, we explore the various modes of transportation and key considerations in Mechelen's urban logistics landscape.

- *Road Network:* The road network in Mechelen serves as the primary transportation mode for urban logistics. It comprises a well-maintained system of streets and highways that connect the city to neighbouring regions and major cities, facilitating the movement of goods by trucks and vans. Efficient road infrastructure is essential for timely deliveries and the accessibility of businesses.
- *Sustainable Mobility Initiatives*: Mechelen places a strong emphasis on sustainable mobility solutions. This includes dedicated bike lanes, pedestrian-friendly zones, and electric vehicle charging infrastructure. Sustainable last-mile delivery options, such as cargo bicycles and electric vans, are increasingly utilized, reducing emissions and traffic congestion in the city centre.
- *Technology Integration*: Mechelen leverages technology to optimize transportation routes and traffic management. Intelligent Transport Systems (ITS) are employed to monitor and control traffic flow, ensuring the efficient movement of goods and

minimizing congestion. Advanced tracking and monitoring systems enhance the visibility of logistics operations.

In conclusion, the transportation systems in Madrid, Florence, Berlin, Prague, Riga, Funchal and Mechelen reflect their geographical and urban characteristics. While road transportation is a common thread, each city employs specific strategies, such as water transport, eco-friendly vehicles, or advanced traffic management, to address their urban logistics needs efficiently and sustainably.

These seven cities epitomize the global diversity and dynamism of urban logistics systems. As they tackle distinct challenges and embrace innovative solutions, their overarching objective remains constant: ensuring the seamless flow of goods while enhancing sustainability, economic well-being, and the overall quality of urban life. In the subsequent sections, we delve deeper into the infrastructural layouts, technology frameworks, stakeholder networks, and transportation landscapes that define each city's urban logistics narrative.

5 Analysis of the current legal framework and policies.

This chapter includes a complete analysis of the current legal framework and policies of the cities, as well as the Sustainable Urban Mobility Plans (SUMPs), the Sustainable Urban Logistics Plan (SULPs), and the Sustainable Energy and Climate Action Plans (SECAPs).

5.1 SUMP

A SUMP, or Sustainable Urban Mobility Plan, is a strategic planning framework used in urban areas to promote sustainable transportation and address mobility challenges. It focuses on creating a more efficient, environmentally friendly, and people-centric transportation system within a city or urban region. They can play a crucial and multifaceted role in shaping the landscape of urban logistic, focusing on different themes such as reducing traffic congestion, last-mile delivery solutions, regulation and zoning, data and technology, stakeholders' collaboration, etc.
A comparative analysis of the SUMPs of the seven UNCHAIN cities will be presented below, focusing on the strategies and objectives identified in the field of urban logistics.

5.1.1 Reference Years and Covered area.

Each UNCHAIN city has adopted a Sustainable Urban Mobility Plan (SUMP) at different time, and the covered areas are different:

- Madrid's SUMP is the most recent, adopted in 2022 and covers the municipality of Madrid.

- Berlin's SUMP, adopted in 2021, covers both the state of Berlin and the broader metropolitan area.
- Prague's SUMP, adopted in 2019, includes the city centre, the Functional Urban Area (FUA), and suburban regions.
- Florence's SUMP was adopted in 2020 and primarily covers the municipal area.
- Funchal's SUMP spans from 2018 to 2027 and covers the municipality area.
- Mechelen adopts its SUMP in 2015, with vision notes going up to 2025 in which it is specified that in the field of logistics, the instrument covers mainly the city centre, although the SUMP relates to the entire municipality.
- Riga does not have a SUMP yet. Nevertheless, the city is currently working on it.

Figure 30 represents the year of SUMP adoption by city.

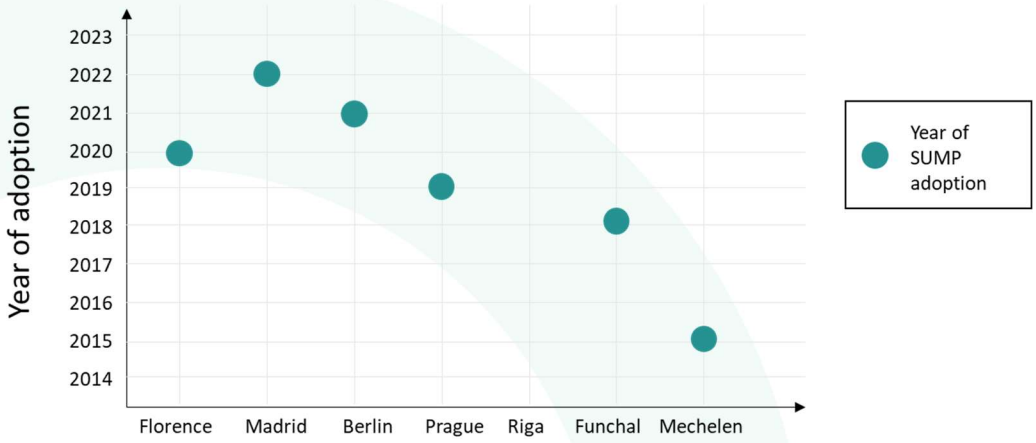


Figure 30 Year of SUMP adoption by city

5.1.2 Urban Logistics issues.

While each city's SUMP focuses on addressing unique challenges specific to its urban logistics context, common objectives across several cities include reducing congestion, improving safety, enhancing sustainability, promoting awareness, and optimizing urban freight operations. These objectives aim to create more efficient and environmentally friendly urban logistics systems, aligning with broader goals of sustainable urban mobility and improving the quality of life in these cities.

In Table 4 are reported the main challenges and objectives in the field of urban logistics, based on the SUMP analysis of the six UNCHAIN cities which have adopted a SUMP.

Table 4 SUMP urban logistics issues per city

	MADRID	FLORENCE	BERLIN	PRAGUE	FUNCHAL	MECHELEN
Challenges	The SUMP in Madrid aims to address issues related to traffic safety, traffic reduction, sustainable mobility, and healthy mobility. It also focuses on reducing parking indiscipline and accident rates.	Florence identifies challenges such as traffic congestion, pollution, energy consumption, and CO_2 emissions, along with issues related to loading/unloading areas and access.	Berlin's SUMP addresses the increase in commercial traffic, congestion, and the influence of delivery traffic on road safety and traffic flow.	Prague faces challenges related to truck access, mobility solutions, air quality, parking occupation, and road infrastructure inadequacy.	Funchal mentions issues such as the lack of regulation for load and unload operations and the reallocation of freight operation parking spots.	Mechelen faces challenges related to parking and circulation, especially for commercial traffic.
Objectives	Madrid's SUMP aims to establish urban distribution of goods with fewer, cleaner vehicles while promoting the rationalization of the distribution chain through digitalization and mixed models of merchandise distribution.	The SUMP in Florence outlines objectives related to reducing road congestion, ensuring the safety of last-mile workers, promoting awareness among consumers about delivery costs, and enhancing the digital management of urban loading-unloading areas.	The plan focuses on avoiding commercial traffic and handling it in an environmentally friendly manner. This includes limiting land consumption, increasing vehicle utilization, and controlling air freight ecologically.	Prague's SUMP objectives include increasing transportation spatial efficiency, reducing the carbon footprint, enhancing performance, improving human health, and creating a new position for a Freight Transport Specialist.	Specific objectives are not listed in the provided text, but Funchal's SUMP likely aims to address these challenges through regulatory measures and optimization of freight operations.	Mechelen's Vision Note outlines objectives such as creating a sustainable logistics plan, promoting sustainable vehicles, reducing traffic in residential and school areas, consolidating goods at the city's edge, and introducing micro hubs for e-commerce.

The five main common issues or challenges, faced by the six cities are the following:

Traffic Congestion: Traffic congestion is a common issue in these cities, leading to delays in goods transportation, increased energy consumption, and higher CO_2 emissions. It affects not only the efficiency of commercial traffic but also the overall mobility within the cities.
Each city adopts a combination of strategies and initiatives to address traffic congestion based on its unique urban logistics and mobility challenges and goals:

- **Madrid** aims to tackle traffic congestion by promoting smart mobility and sustainable planning. The city focuses on reducing road congestion through the rationalization of distribution chains, digitization of cargo receptors, and the promotion of green

mobility and clean vehicles. Madrid also emphasizes the reduction of parking indiscipline and accident rates to improve traffic flow.

- **Florence** addresses traffic congestion by focusing on smarter distribution and ordering in cooperation with merchants. The city is researching more efficient distribution methods to reduce traffic in residential and school areas, consolidate goods at the city's edge, and introduce micro hubs for e-commerce.
- **Berlin** focuses on avoiding commercial traffic through concepts like traffic avoidance, securing potential areas, and controlling land consumption. It also seeks to implement necessary commercial traffic in a city-friendly manner by preserving the urban structure, providing infrastructure, and promoting the use of environmentally friendly vehicles and drives.
- **Prague** addresses traffic congestion through the development of an integrated commercial transport concept. The city aims to increase transportation spatial efficiency, reduce the carbon footprint, enhance performance and reliability, and improve human health. Prague is also considering measures such as shared vehicles and park-and-ride facilities to alleviate congestion.
- **Funchal**'s objectives include expanding low-traffic zones in the city centre and researching smarter distribution methods in cooperation with merchants. The city is working on creating a sustainable logistics plan, introducing more sustainable vehicles, and reducing traffic in residential and school areas.
- **Mechelen** is focused on reducing traffic congestion by promoting traffic safety and researching smarter distribution methods in cooperation with merchants.

Air Quality and Pollution: Several cities are grappling with air quality concerns due to increased commercial traffic. Poor air quality can have adverse effects on public health and the environment. These cities aim to reduce emissions and improve air quality through sustainable logistics practices:

- **Madrid** aims to reduce greenhouse gas emissions and fulfil EU air quality norms through modal shifts toward green mobility and clean vehicles, particularly electrification. Madrid also seeks to reduce the overall carbon footprint by optimizing urban distribution of goods with cleaner vehicles and promoting digitization of cargo receptors.
- **Florence** aims to improve air quality by consolidating goods at the edge of the city and implementing micro hubs for e-commerce.
- **Berlin**'s vision includes the development of more sustainable vehicles and drives. It also promotes the use of alternative fuels and logistical concepts to handle traffic more efficiently and in a city-friendly manner.
- **Prague** is setting objectives to reduce the carbon footprint. The city aims to increase transportation spatial efficiency and enhance performance and reliability.
- **Funchal** focuses on reducing air pollution by expanding low-traffic zones in the city centre. The city is researching smarter distribution methods in cooperation with merchants to reduce the environmental impact of goods transportation.

- **Mechelen**'s emphasis on introducing more sustainable vehicles and consolidating goods at the edge of the city aligns with its goals to reduce emissions and improve air quality.

Lack of Efficient Loading/Unloading Areas: Inadequate loading/unloading areas and difficulties in accessing these areas pose challenges for urban logistics. Efficient distribution of goods within cities requires well-designed infrastructure and access points.

- **Madrid** aims to promote the rationalization of the distribution chain by developing a mixed model of urban merchandise distribution. This involves establishing large logistics platforms on the access roads to Madrid and final load breaking points within the city (last mile with cyclologistics) in collaboration with logistics operators.
- **Florence** is researching smarter distribution and ordering methods in cooperation with merchants to address the challenge of inefficient loading/unloading areas. By consolidating goods at the city's edge and implementing micro hubs for e-commerce, the city aims to optimize these processes.
- **Berlin** focuses on securing inner-city logistical hubs and upgrading them in an environmentally compatible way. The city also seeks to provide the necessary infrastructure for efficient commercial traffic, including loading and unloading areas.
- **Prague** acknowledges the challenge of inadequate road infrastructure and its impact on loading/unloading areas. Identifying and securing areas for commercial traffic is also a priority.
- **Funchal** aims to reduce disruption of public space by commercial traffic, which includes addressing the issue of inefficient loading/unloading areas. The city is researching smarter distribution methods to optimize these processes while minimizing their impact on public spaces.
- **Mechelen** promotes the digital management of urban spaces dedicated to loading/unloading operations to address inefficiencies in this area. The city also emphasizes the development and use of new inner-city logistics concepts, such as city logistics hubs and micro depots, to optimize loading and unloading processes.

Infrastructure Challenges: Many cities face challenges related to their road infrastructure. The slow development of critical road networks and the mismatch between infrastructure growth and population expansion can result in congestion and logistical inefficiencies.

- **Madrid** acknowledges the need to reduce parking indiscipline and accidents, which are often related to infrastructure challenges. Additionally, Madrid is likely investing in infrastructure improvements to support sustainable and healthy mobility.
- **Florence** is researching smarter distribution methods to address the infrastructure challenges related to efficient goods transportation. By consolidating goods at the city's edge and implementing micro hubs for e-commerce, the city can optimize transportation routes within existing infrastructure.
- **Berlin** is securing inner-city logistical hubs and providing infrastructure for efficient commercial traffic. Collaboration with companies is a key strategy to develop and implement space-saving, clean, and safe commercial transport approaches.

- **Prague** faces challenges with its road infrastructure, particularly the slow development of critical road networks. To address this, the city is focusing on the maintenance and renovation of infrastructure, including bridges.
- **Funchal** is researching smarter distribution methods to optimize logistics processes and reduce congestion in areas with infrastructure limitations.
- **Mechelen** promotes the development and use of new inner-city logistics concepts, such as city logistics hubs and micro depots, to optimize logistics operations within existing infrastructure.

Promotion of Sustainable Mobility: Encouraging sustainable and eco-friendly mobility options is a shared objective among these cities. This includes reducing the reliance on conventional vehicles, promoting alternative propulsion methods, and adopting cleaner transportation technologies.

- **Madrid** aims to reduce greenhouse gas emissions and achieve EU air quality standards through modal shifts towards green mobility and clean vehicles, particularly electrification.
- **Florence** seeks to reduce the reliance on conventional vehicles and promote eco-friendly transportation options by consolidating goods at the city's edge and implementing micro hubs for e-commerce, the city.
- **Berlin** focuses on the development of sustainable mobility solutions. The city envisions cargo bikes becoming increasingly important, particularly in densely populated local centres.
- **Prague** addresses sustainable mobility by setting objectives to reduce the carbon footprint. The city also seeks to improve human health through sustainable mobility practices.
- **Funchal** aims to reduce traffic in residential and school areas to promote sustainable mobility. The city's strategy includes researching smarter distribution methods and creating sustainable logistics plans to optimize transportation routes and reduce the environmental impact of mobility.
- **Mechelen** encourages the consolidation of goods at the city's edge for sustainable transport into the urban area and aims to introduce more sustainable vehicles.

5.1.3 SUMP scenarios and measures.

Based on the analysis of problems and opportunities, different scenarios should be developed and discussed with citizens and stakeholders. These scenarios help to improve the understanding of what urban logistics of the city could look like in the future.
A scenario is a description of a specific set of developments in the future which are relevant to urban mobility, including the likely effects of external factors, as well as those of strategic policy priorities.

In the SUMPs of the cities of Madrid, Florence, Berlin, Prague, Funchal and Mechelen, there are no specific scenarios related to urban logistics.

Moving from the strategic to the operational level, measures are set to reach the agreed objectives and targets. The development of effective measure packages is at the core of Sustainable Urban Mobility Planning because only well-selected measures will ensure that the defined objectives and targets are met.

In order to compare the measures, five different areas have been identified:

- **Technical measures/Operational measures:** These actions involve optimizing the logistics operations within a city. This include improving last-mile delivery routes, implementing real-time tracking systems for deliveries, and optimizing loading and unloading processes to reduce congestion and improve efficiency.
- **Infrastructure measures/Clean and alternative fleet**: This category of measure includes the creation of loading and unloading zones, establishing urban distribution centres and building infrastructure to support clean and low-emission delivery vehicles, such as electric vehicle charging stations.
- **Policy-based measures/Smart Governance & Regulations:** These actions include regulations related to delivery hours, emissions standards for delivery vehicles, and zoning laws that designate areas for distribution centres. Smart governance involves using data and technology to manage logistics operations more effectively, such as dynamic routing based on real-time traffic data.
- **Purpose oriented data acquisition:** Data collection in urban logistics can involve tracking delivery vehicle movements, monitoring air quality in delivery-intensive areas, and collecting data on delivery demand patterns. This data is crucial for optimizing delivery routes and schedules.
- **Soft measures/Consumer engagement:** In the context of urban logistics, soft measures include public awareness campaigns to encourage residents to choose off-peak delivery times, use centralized delivery lockers, or support eco-friendly delivery options. Consumer engagement can play a role in reducing the environmental impact of urban logistics.

Madrid primarily focuses on measures aimed at promoting the shift to cleaner vehicles for urban freight distribution, with a significant amount of funding allocated to this purpose. Grants for the renewal of 2.500 vehicles and an investment of 12 million euros over 8 years indicate a strong commitment to low-emission vehicles to enhance urban logistics.
Florence is concentrating on a range of measures cantered on smart policies and regulations, with a goal of regulating loading and unloading hours, introducing a reservation system for loading and unloading bays, and incentives for decarbonizing the fleet of delivery vehicles.
Berlin is adopting a comprehensive strategy, focusing on the creation of new urban logistics concepts, such as urban hubs and micro-depots. These measures aim to optimize delivery efficiency within the city.
Prague is working on various categories of measures, especially on measures for reducing the carbon footprint. This includes reducing emissions of VOCs and promoting electric vehicles. At the same time, they are implementing policies to reduce traffic in certain key areas.

Funchal seems to primarily focus on a range of measures related to improving urban mobility in general, with an emphasis on actions like traffic calming, optimizing public transport, and promoting electric mobility.
Mechelen is adopting measures primarily aimed at improving traffic and delivery management in the city. These measures include the creation of management and control systems for loading and unloading areas and the revision of regulations concerning loading and unloading hours.

5.1.4 Urban logistics measures evaluation and potential funding sources.

In the field of urban logistics, assessing the effectiveness of implemented measures is crucial. In this chapter are explored the key performance indicators (KPIs) employed in this assessment process.

From the analysis of the questionnaire result emerge that Madrid and Florence have established specific indicators and evaluation frequencies for their urban logistics measures. Prague's approach is more dynamic and collaborative, with ongoing evaluation and progress monitored by the Working Group. Berlin, Funchal, Riga and Mechelen do not provide specific indicators for evaluation in the provided information in the field of urban logistics.

In Table 5 is reported a brief description for each demo city which provides specific indicators.

Table 5 SUMP Urban logistics measure evaluation

	Madrid	Florence	Prague
General description	Madrid conducts an annual review of indicators related to urban logistics measures. These indicators include the number of subsidized clean vehicles, the number of charging points in microplatforms, the number of logistic centers, the number of microplatforms, the number of monitored loading & unloading areas, the total number of loading & unloading areas, the number of lockers for e-commerce deliveries, and the percentage of delivery vehicles operating from 22:00 to 07:00 compared to the total.	Florence conducts monitoring every 2 years to evaluate urban logistics measures. The evaluation includes indicators such as the ratio between the total time spent on congested road networks and the total "virtual" time spent in the absence of congestion, the number of sustainable commercial vehicles in restricted traffic areas, and the number of vehicles with different emission classes relative to the total number of registered cars.	Prague's evaluation approach is dynamic and ongoing as part of its Sustainable Urban Mobility Plan (SUMP). The city does not have predefined indicators but rather focuses on tracking progress, task completion, and the development of indicators related to the SUMP's strategic objectives. They also conduct annual Action Plan Implementation Progress Reports and involve various committees and groups in the monitoring process.
KPI	• Number of subsidised clean vehicles • Number of charging points in microplatforms (+100 by 2030) • Number of logistic centres • Number of microplatforms • Number of monitored loading & unloading areas • Number of loading & unloading areas • Number of lockers • % delivery vehicles from 22h to 7h/total	• Ratio between the total time spent on a congested road network and the total "virtual" time spent in the absence of congestion • "sustainable" commercial vehicles (cargo-bike, electric, methane, hydrogen) active in restricted traffic areas/total km^2. of ZTL-hour (n. commercial vehicles active in the ZTL compared to its extension (km^2) per unit of time) • number of vehicles with emissivity class ≤EURO5/ total number of registered cars (open vehicle fleet) • number of vehicles with emissivity class > EURO5/ total number of registered cars (open vehicle fleet) • number of electric vehicles / total number of cars	No specific indicators are provided

In general, cities try to combine a variety of financial sources to ensure the success of the actions planned in their SUMPs. These sources may include public funding, grants, private funds, external investments and more. Particularly significant is the experience of Prague, which involves several organisations in the implementation of SUMP actions, each of which can allocate funds from its budget for its specific responsibilities in the SUMP.

Collecting data about SUMP results can be challenging, but by reviewing academic literature, there are several papers that face this topic proving the effectiveness of SUMPs.
In a 2018 study about the “Review of policies and measures for sustainable and energy efficient urban transport” focused on European SUMPs, it was discovered that globally in EU

the adoption of this tool has brought some improvements especially in the reduction of carbon emissions. Well selected measures and/or their optimal combination can substantially decrease the energy consumption and CO_2 footprint. The most important finding highlighted in the paper is that individual measures can lead to an average saving of about 20–30%, while their optimal combination can result in savings of up to 60–70%. This study involved five cities participating in the UNCHAIN project (Berlin, Prague, Florence, Riga; Madrid)[20]. Another interesting research on the effectiveness of SUMPs is a simulation of the impact on PM2.5 and NO_2 emissions in 642 European cities adopting SUMPs based on 22 group of policy measures relevant to transport and mobility at urban level (without considering electro-mobility options). The results showed some little but significant decreases on PM2.5 (up to 2%) and on NO_2 urban background concentration (close to 4%). This study involved five cities participating in the UNCHAIN project (Berlin, Prague, Florence, Riga, Madrid)[21].

5.2 SULP

The Sustainable Urban Logistics Plan (SULP) is a useful tool supporting Local Public decision-makers and stakeholders in "governing" city logistics measures and enhancing freight distribution processes towards economic, social environmental sustainability and efficiency. The plan involves strategies, measures and rules that can be adopted with a cooperative approach among different actors for reaching common objectives aimed at an overall urban sustainability.

In other words, a Sustainable Urban Logistics Plan is a strategic plan designed to satisfy freight mobility needs of people and business in cities and their surroundings, to achieve a better quality of environment and of life. It builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles.
In this chapter, the state of the art of the SULPs of the UNCHAIN cities will be presented, focusing on the main critical issues highlighted within the urban logistics system, the objectives set and the measures to be taken to achieve them.

5.2.1 Reference Years and Covered area.

Freight and logistics ought to have a specific focus in mobility policies and a dedicated planning process because of their impacts on urban eco-system. The SULP should be fully integrated with the SUMP, but it needs dedicated skills, resources and collaboration with private stakeholders and different levels of governance at wider level (metropolitan, regional

[20] Tomislav Letnik, Maršenka Marksel, Giuseppe Luppino, Andrea Bardi, Stane Božičnik, Review of policies and measures for sustainable and energy efficient urban transport,2018, Energy, Volume 163, Pages 245-257, ISSN 0360-5442, https://doi.org/10.1016/j.energy.2018.08.096.
[21] E. Pisoni, P. Christidis, P. Thunis, M. Trombetti,Evaluating the impact of "Sustainable Urban Mobility Plans" on urban background air quality, ,2019, Journal of Environmental Management,Volume 231,Pages 249-255,ISSN 0301-4797, https://doi.org/10.1016/j.jenvman.2018.10.039.

at least) to be effective. Characterisation of flows and logistic needs is fundamental, but it is also the main obstacle in the definition of a SULP.

The seven cities of UNCHAIN (Madrid, Florence, Berlin, Prague, Funchal, Riga and Mechelen) have made efforts to address urban logistics challenges through Sustainable Urban Logistics Plans (SULPs) or similar initiatives.

While some cities such as Florence, Berlin and Funchal have dedicated SULPs covering large geographical areas, others such as Madrid, Prague and Mechelen have adopted alternative approaches and policies to address urban logistics.

In particular, **Florence** adopted its SULP in March 2023, with a planned duration of ten years. This plan focuses mainly on the metropolitan area, emphasising the importance of coordinating logistics over a wider geographical area rather than just the city itself. **Berlin** adopted its SULP in 2021, addressing the challenges of logistics in the city. Its scope extends beyond the city limits, covering not only the state of Berlin but also considering the Functional Urban Area (FUA) and the metropolitan area. This approach recognises the interconnection of logistics systems within a wider geographical context. In **Funchal** the SULP was adopted in 2019. It covers the city centre, most specifically the two main nodes in the consolidated urban area.

Although **Madrid** has no SULP, in 2022 the city council launched a study on urban logistics (Madrid 360 strategy) which remains highly relevant in the context of the urban logistics. The **Prague** situation is similar, as even if it does not currently have a SULP, creating one is among the objectives outlined in the city's Sustainable Urban Mobility Plan (SUMP). As part of that, in 2019, the Prague Institute for Planning and Development conducted a study on logistics systems. **Mechelen** also has no SUMP, but in 2020 signed a pact entitled 'Sustainable and Efficient Urban Logistics in Mechelen. This pact outlines a logistics strategy covering almost ten years focusing on the city centre (the area within the ring with connections to the station environment).

The year of SULP adoption for UNCHAIN cities is shown in Figure 31. If the dot is yellow ochre, it means that the city has adopted a SULP, if the dot is faded yellow it means that the city has undertaken studies on urban logistics.

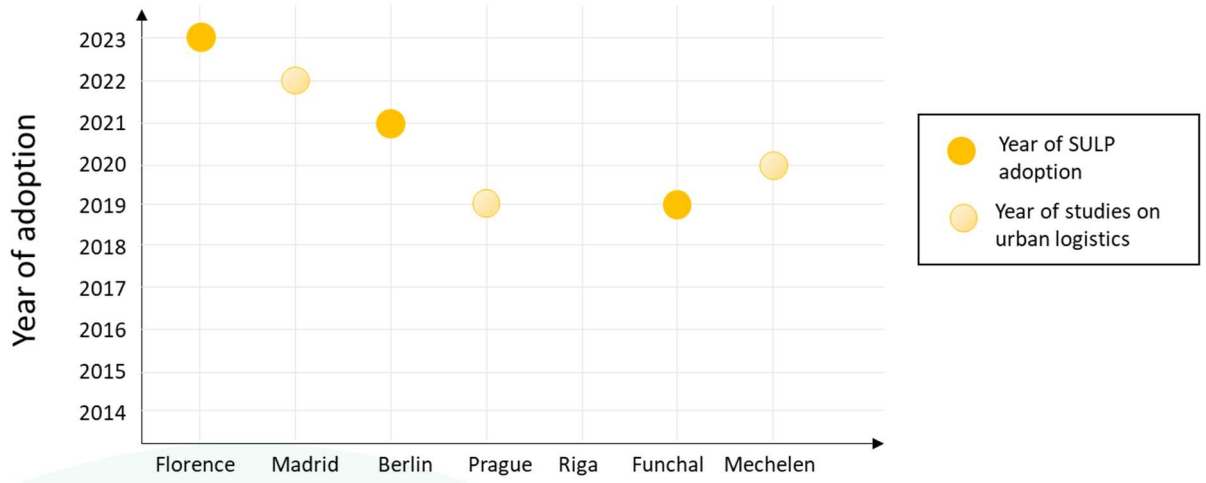


Figure 31 Year of SULP adoption by city

5.2.2 Urban Logistics issues.

SULPs, or Sustainable Urban Logistics Plans, are strategic frameworks designed to optimize and manage the flow of goods and services within urban environments. These plans encompass a wide range of policies, strategies, and initiatives aimed at enhancing the efficiency, sustainability, and resilience of urban logistics systems. The development of a SULP begins with a thorough identification and analysis of the problems and challenges faced by urban logistics systems.

In **¡Error! No se encuentra el origen de la referencia.** is reported a synthetic view of the main challenges and objectives addressed by the UNCHAIN cities which often face common challenges such as traffic congestion, emissions, and parking issues, but their objectives and strategies differ based on their unique circumstances and priorities.

Table 6 SULP urban logistics issues per city

	MADRID	FLORENCE	BERLIN	PRAGUE	FUNCHAL	MECHELEN
Challenges	• Lack of control and data on the correct use of loading and unloading areas • Parking indiscipline in loading and unloading areas • Rapid growth of e-commerce • Insufficient loading and unloading areas • Increase in heavy vehicles on main access roads • High emissions and noise pollution	• Fragmentation and poor coordination of decision-makers • Traffic congestion • Lack of e-commerce delivery points • Absence of Cargo Bike services • Increased traffic due to e-commerce • Insufficient funding for low-impact vehicles	• Traffic emissions and congestion • Poor utilization of delivery zones • Inefficient energy use • Noise pollution	• E-commerce growth and infrastructure concerns • Double parking and sidewalk parking • Commercial vehicles in historic areas • Air pollution from commercial vehicles • Unnecessary journeys for last-mile deliveries • Lack of quality freight transport infrastructure	• High number of duty vehicles • Prevalence of light-duty vehicles • Exceeding parking time restrictions • Illegal parking on sidewalks • Inadequate fleet with an average age of 11 years	• Zero emission urban distribution (Horizon 2030)
Objectives	• Reduce emissions and improve air quality • Decrease congestion and accidents • Address parking indiscipline • Optimize loading and unloading operations • Reduce morning and midday concentration of operations	• Reduce congestion and improve accessibility • Enhance freight transportation efficiency • Improve air quality and reduce emissions • Collaborate with logistics stakeholders	• Consider urban logistics in infrastructure planning • Protect logistics sources and destinations • Promote data sharing in logistics • Extend supply and disposal times • Plan a main route network for large transports • Reduce emissions and promote road safety	• Improve last-mile deliveries • Enhance freight transportation infrastructure • Engage with private companies • Launch marketing campaigns for sustainable logistics • Create specialized positions for logistics planning	• reduction of constraints • reduction of pollutants emissions • adherence of freight agents to discussion groups • reduction of the number of vehicles • increase of satisfaction of local traders regarding freight operations	• Reduce the number of transport movements • Decrease the number of kilometers driven • Reduce CO_2 emissions • Improve air quality

Referring to the five categories of 'main issues' already analysed in chapter 3.2, in relation to SULPs the cities are placed as follows:

Traffic Congestion

- **Madrid** recognizes that reducing congestion not only enhances traffic flow but also aligns with broader environmental objectives. To achieve these goals, the city has implemented specific measures including exerting control over loading and unloading areas to prevent misuse and combat parking indiscipline.
- To address congestion, **Florence** envisions the integration and redevelopment of industrial and commercial areas. This approach aims to streamline traffic flow and reduce bottlenecks in key areas. Additionally, Florence is exploring modal shifts in

freight transportation by considering the use of railways and water transport infrastructure.

- **Berlin** seeks to optimize logistics by planning a dedicated main route network for large and heavy transports, thereby minimizing traffic congestion. Moreover, the city is supporting research in urban logistics to find innovative solutions to congestion-related challenges.
- **Prague** acknowledges congestion as a significant concern, particularly in historic city centre neighbourhoods characterized by narrow streets. Prague's strategy includes measures aimed at improving last-mile deliveries and upgrading the freight transportation infrastructure. Moreover, Prague actively seeks collaboration with private companies and entities to find effective solutions to congestion issues. This collaborative approach is expected to reduce unnecessary journeys for deliveries, further alleviating congestion.
- **Funchal** faces challenges stemming from traffic congestion, notably caused by light-duty vehicles and illegal parking on sidewalks. To address this issue, Funchal places importance on the need to enforce parking time restrictions rigorously.
- **Mechelen** grapples with congestion challenges related to parking time exceeding restrictions and an inadequate logistics fleet. Moreover, through improved coordination and efficient use of logistics resources, the city aims to alleviate congestion, creating a smoother and less congested urban environment.

Air Quality and Pollution

- **Madrid** has developed the Madrid 360 strategy with a central aim of enhancing air quality by curbing emissions generated by commercial vehicles. To combat this, Madrid is actively promoting alternative fuels as a cleaner and more sustainable option. In parallel, the city is committed to reducing noise pollution stemming from commercial vehicle activities, further contributing to a healthier urban environment.
- The key strategy employed in **Florence** is to encourage a transition to vehicles with minimal or zero environmental impact. This transition is supported by the promotion of alternative fuels and the development of charging infrastructure tailored for freight vehicles.
- **Berlin** places a strong emphasis on reducing emissions and enhancing energy efficiency in logistics operations. This is manifested through measures such as fleet renewal and transformation, which promote the adoption of low-impact vehicles. Berlin also actively encourages the use of alternative fuels.
- **Prague**'s Logistics Study underscores the concern of air pollution, primarily attributed to commercial vehicles operating within the city. To mitigate this issue, the city aims to improve last-mile deliveries, effectively reducing the number of vehicles on the road. Simultaneously, Prague is committed to fostering the sustainable growth of freight transport while maintaining high delivery standards.
- **Funchal** acknowledges the air quality and pollution challenges it faces, particularly due to a high number of light-duty vehicles associated with micro logistics.
- In **Mechelen**, challenges related to air quality and pollution are associated with an inadequate logistics fleet and aging vehicles. One of the primary solutions is fleet

renewal and the promotion of low-impact vehicles. Additionally, Mechelen is committed to supporting infrastructure development to accommodate eco-friendly vehicles.

Lack of Efficient Loading/Unloading Areas

- **Madrid** recognizes the lack of control over loading and unloading areas as a significant challenge. The city's strategy involves optimizing these areas to enhance overall logistics efficiency. Specific measures like improving the identification and utilization of loading and unloading zones, are being implemented to achieve this goal.
- **Florence** emphasizes the importance of establishing efficient delivery and loading zones to address this challenge effectively. As part of its solution, Florence proposes the promotion of cargo bikes for goods distribution in central areas. This not only mitigates traffic and parking issues but also offers a sustainable and space-efficient mode of transportation, contributing to the overall efficiency of logistics operations.
- **Berlin**'s plan outlines actions aimed at establishing and optimizing delivery and loading areas. The city places significant emphasis on planning logistics spaces and activities in a coordinated manner.
- **Prague**'s Logistics Study highlights the issue of commercial vehicles entering historic city centre neighbourhoods with limited space for loading and unloading. To alleviate this challenge Prague aims to improve last-mile deliveries, reducing congestion in these historically sensitive areas.
- **Funchal** faces parking challenges and recognizes the importance of establishing quality and affordable freight transport infrastructure options, including loading and unloading areas. In particular, Funchal address the issue of lack of regulation for load and unload operations.
- **Mechelen**’s plan does not tackle this issue directly.

Infrastructure Challenges

- **Madrid**'s strategy does not tackle this issue directly.
- **Florence** recognizes the potential of railways and water transport to provide more efficient and eco-friendly logistics options.
- **Berlin**'s Sustainable Urban Logistics Plan (SULP) comprehensively addresses infrastructure as one of its key areas of action. The city is committed to incorporating urban logistics considerations into all infrastructure measures. This holistic approach ensures that infrastructure aligns with logistics needs. Additionally, Berlin aims to create a main route network specifically designed for large and heavy transports.
- **Prague** acknowledges infrastructure challenges, particularly in historic city centre. By fostering partnerships and implementing targeted solutions, Prague seeks to optimize its logistics infrastructure.
- **Funchal** addresses infrastructure challenges by emphasizing the importance of quality and affordable freight transport infrastructure options. By enhancing the infrastructure supporting logistics, Funchal aims to create a more efficient and seamless urban logistics environment.

- In **Mechelen**, infrastructure challenges encompass aspects like loading/unloading areas and the overall logistics network.

Promotion of Sustainable Mobility

- **Madrid** is implementing specific measures to encourage sustainable mobility in logistics operations. These measures may include providing incentives to logistics companies to adopt electric or alternative fuel vehicles, thereby reducing emissions. Additionally, Madrid is actively supporting the development of charging infrastructure, which is crucial for the widespread adoption of cleaner transportation options.
- **Florence** places a strong emphasis on improving the quality of life for its residents while concurrently addressing the issue of pollution through sustainable logistics. Central to this effort is the promotion of vehicles with reduced or zero environmental impact. Furthermore, Florence recognizes the importance of robust charging infrastructure to support sustainable mobility.
- **Berlin**'s Sustainable Urban Logistics Plan (SULP) encompasses a comprehensive approach to promoting sustainable mobility. The city has set clear objectives in this regard and Berlin's measures include supporting the establishment of transparent and regular communication and participation among stakeholders, promoting the use of alternative fuels and, in general, create awareness about the urban logistics.
- **Prague** has set two macro-objectives regarding the promotion of sustainable mobility. The first one is about the stakeholder's engagement in the various stage of logistics planning. The second one concerns the deployment of marketing campaigns to support sustainable logistics, with the aim to educate the end customers.
- **Funchal's** plan has specifics actions to mitigate the issue of limited awareness between stakeholders and end users. For this reason, awareness raising campaign and eco-driving campaigns have been planned.
- **Mechelen**'s commitment to sustainable mobility involves the adoption of a bottom-up approach to create awareness among stakeholders and end users.

5.2.3 SULP scenarios and measures.

SULP scenarios represent specific situations or contexts in which sustainable urban logistics plans are developed to address the challenges of freight distribution in cities.

Between the UNCHAIN cities, only Florence and Madrid have specific SULP scenarios, while Berlin, Prague, Mechelen and Funchal have not defined detailed scenarios in their SULPs (or similar planning instruments/studies).

In particular, Madrid's scenario deals with the transition from a traditional urban freight transport model to a more modern urban logistics system. The focus is on establishing peripheral logistic centers, microplatforms, and last-mile distribution using clean, lower-capacity vehicles. This transition aligns with sustainability goals and the reduction of emissions in urban areas, which is crucial for improving air quality and reducing congestion.

Instead, Florence's SULP scenario involves an incremental approach. Three different scenarios (Governance and Policy, Infrastructure, and Ecological Transition) have been identified and in each scenario have been combined the nine measures of the plan differently. This demonstrates a comprehensive approach to addressing urban logistics challenges, considering governance, infrastructure development, and ecological sustainability. The phased implementation plan also reflects a well-thought-out strategy for gradually achieving the goals.

In **¡Error! No se encuentra el origen de la referencia.** are listed the main measures category (see chapter **¡Error! No se encuentra el origen de la referencia.**) per issues. The future implementation of specific measures is essential to move from a strategic to an operational level.

Table 7 SULP measures

ISSUES	MEASURES	EXAMPLES
Traffic congestion	Technical measures/Operations measures	Design a main route network for large and heavy transport (Berlin)
	Policy-based measures/Smart Governance & Regulations	Extend the schedule of cargo bays to spread out operations throughout the day (Madrid)
	Purpose oriented data acquisition	Implement a system to monitor and manage the occupancy of loading zones in real-time to optimize their utilization (Prague)
	Soft measures/Consumer engagement	Provide real-time information on cargo bay occupancy to reduce traffic caused by drivers searching for parking spaces (Madrid)
Air Quality and Pollution	Infrastructure measures/Clean and alternative fleet	Promote the use of clean vehicles for urban goods delivery within the city (Mechelen)
	Policy-based measures/Smart Governance & Regulations	Harmonize regulations for access to Limited Traffic Zones (ZTL) and loading/unloading areas (Madrid)
	Purpose oriented data acquisition	Develop a city data platform for planning support and monitoring air quality (Madrid)
Lack of Efficient Loading/Unloading Areas	Infrastructure measures/Clean and alternative fleet	Increase the number of cargo bays to reduce congestion during loading and unloading (Madrid)
	Technical measures/Operations measures	Reorganization of loading/unloading areas in the city centre with a focus on

ISSUES	MEASURES	EXAMPLES
		parking/overnight areas for heavy vehicles (Florence)
	Purpose oriented data acquisition	The development of ICT (Information Communication Technology) solutions for access, booking, data collection and planning support (city data platform) in a smart city logic (Florence)
Infrastructure Challenges	Infrastructure measures/Clean and alternative fleet	Implement an urban distribution centre to consolidate and streamline goods delivery within the city (Funchal)
Promotion of Sustainable Mobility	Infrastructure measures/Clean and alternative fleet	Increase the availability of charging stations for electric vehicles to support sustainable mobility for goods transport (Funchal)
	Policy-based measures/Smart Governance & Regulations	Offer incentives for businesses to adopt electric vehicles by installing rechargeable points for EVs in the city (Funchal)
	Soft measures/Consumer engagement	Establish a dedicated freight logistic manager role to oversee sustainable mobility initiatives and engage in awareness campaigns (Prague)

Madrid's measures primarily focus on "Technical measures/Operations measures." These measures aim to optimize logistics operations within the city. They include increasing the number of cargo bays, extending cargo bay schedules, implementing specialized vigilance for parking breaches in cargo bays, providing new signage in cargo bays, and offering information on cargo bay occupancy. These measures are geared towards improving the efficiency of last-mile deliveries and reducing congestion.

Florence's SULP measures span multiple categories, including "Technical measures/Operations measures," "Infrastructure measures/Clean and alternative fleet," "Policy-based measures/Smart Governance & Regulations," and "Purpose-oriented data acquisition." This comprehensive approach involves establishing partnerships, harmonizing regulations, developing ICT solutions, and encouraging low-impact alternative fuel transport systems. The focus is on creating synergy between physical and digital infrastructure, supporting clean vehicles, and improving logistics efficiency.

In **Berlin**'s SULP there aren't specific measures but there are general area of action, such as "Policy-based measures/Smart Governance & Regulations" referred to conduct studies on potentials of micro depots in order to develop guidelines for implementing micro depots and loading areas.

Prague's SULP measures are not explicitly categorized, but they emphasize actions such as improving last-mile delivery, enhancing freight transportation infrastructure, engaging stakeholders, conducting marketing campaigns, and addressing human resources. These measures focus on optimizing operations and raising public awareness about sustainable logistics.

Funchal's SULP measures encompass a wide range of categories, including ”freight operators engagement actions” such as discussion forum for freight logistics and establishment of a freight logistic manager, ”regulation actions” like readjustment of delivery time window and implementation of low emission streets, “logistic operation” such as implementation of a urban distribution centre and development of an online booking system and “technological measures” like implementation of a real-time monitoring system of parking spots dedicated for unload and load operations.

Mechelen's measures span several periods, with a gradual transition towards a zero-emission fleet. These measures align with the "Infrastructure measures/Clean and alternative fleet" category and involve policy implementation, investment planning, and legal frameworks to support the adoption of zero-emission vehicles. Mechelen aims to reach 100% zero-emission urban distribution by 2030, emphasizing sustainability and reducing emissions.

5.2.4 Urban logistics measures evaluation and Potential funding sources.

In the ever-evolving landscape of cities around the world, the planning and implementation of sustainable urban logistics measures have become a crucial priority. Challenges stemming from population growth, urbanization, and increased traffic have made it essential to optimize transportation and logistics systems in urban areas. However, the success of such measures cannot be determined solely by their adoption; it requires continuous monitoring and assessments based on objective data. In this context, Key Performance Indicators (KPIs) play a fundamental role. They serve as tools for measurement, monitoring, and assessment to understand whether the planned strategies are yielding the desired outcomes and whether cities are progressing towards sustainability goals and improving the quality of life.

Performance indicators can encompass a wide range of aspects, including energy efficiency, pollutant emissions, traffic reduction, delivery optimization, commercial vehicle management, air quality, and more. Their value lies in providing a clear and transparent view of trends and progress made, enabling city authorities and relevant stakeholders to make informed decisions and make course corrections when necessary.

Furthermore, KPIs facilitate comparisons among different cities and the sharing of best practices. These indicators provide a common language that allows cities worldwide to exchange experiences and positive practices, contributing to the creation of more effective and sustainable solutions for urban logistics challenges.

Between the UNCHAIN cities, only Florence and Funchal have specific indicators related to urban logistic measures as part of their SULP. **¡Error! No se encuentra el origen de la referencia.** shows a general description and a detailed KPI list for the two cities.

Table 8 SULP Urban logistics measure evaluation

	Florence	Funchal
General description	Florence is actively engaged in the implementation of sustainable urban logistics measures to address the challenges posed by urbanization and increased traffic. The city places a strong emphasis on monitoring and evaluation to track progress and make informed decisions regarding its logistics initiatives. Monitoring reports are generated every two years, providing comprehensive insights into the performance of the measures.	SULP has calculated emissions related to logistics. 29.704 tCO_2 (2018 baseline year) 3 performance levels: • Environment • Mobility • Logistic operations
KPI	• n. "sustainable" commercial vehicles (cargo-bike, electric, methane, hydrogen) active in restricted traffic areas/total km^2 of ZTL-hour • overall and integrated regulatory system (goods and passengers) to be implemented through tariff policies for vehicle access (ZTL paid access) rewarding an eco-sustainable last mile • annual fuel consumption per capita: • percentage of infrastructural interventions carried out, out of those envisaged by the SULP, in favour of sustainable logistics. • percentages of Municipalities, compared to the entire CMFI, with review of the instruments in force in the transport and mobility sector in compliance with the SULP • creation of new Hubs • n. of ICT tools for metropolitan infomobility • percentage of alternative fuel vehicles. • Set up of a permanent FQP • Light commercial vehicle mileage. • loading/unloading time • operator accreditation system.	Data gathered through sensors or by Copert: • Particles (PM10 and PM2.5) • Ozone (03) • Nitrogen Oxide (NO2) • Sulfur Oxide (SO2) • Carbon Dioxide (CO_2) • Nitro Oxide (N20) • Methan (CH4) Data collected through sensors and surveys geared at local traders: • Noise Level Data collected through speed measurement: • Road congestion Traffic counts through car plates: • Freight logistic intensity Traffic counts through car plates, complemented with a survey: • Distance travelled by freight vehicles Traffic counts through car plate: • Average age of freight vehicles Sensors or empirical observation: • Parking time for freight operations Number of registrations: • Participation rate of freight agents in discussion forum for freight logistics

In general, funding sources for actions in Sustainable Urban Logistics Plans may vary from city to city, but often include public resources at national and local level, European funding, research and innovation programmes, as well as the possibility of collaborating with the

private sector through public-private partnerships. Diversification of funding sources is essential to ensure the successful implementation of sustainable urban logistics actions.

The example of Berlin is particularly significant, indeed Berlin has multiple funding sources for actions outlined in its SULP, including funds from the state budget, joint task funds for improving the regional economic structure (GRW), EU funding programs such as the European Regional Development Fund (ERDF), and research and innovation programs like Horizon Europe. Additionally, there are specific funds like the "Growing City Infrastructure Special Fund (SIWA)" and the "Sustainability Fund (SIWANA)."

5.3 SECAP

The Covenant of Mayors is the first European Union initiative launched by the European Commission directly targeting local authorities and their citizens to take the lead in the fight against global climate change. Since 2008, the Covenant of Mayors has developed into the leading movement for local authorities ready to step up their ambitions on sustainable energy and climate change. By joining the Covenant of Mayors, local authorities voluntarily commit to reducing greenhouse gas emissions in the different sectors (Public, Residential, Tertiary, Industrial and Trasport) and improving climate resilience by 2030 through the implementation of a Sustainable Energy and Climate Action Plan (SECAP). This document, officially approved by the City Councils, outlines the measures and policies Municipalities will implement to achieve their targets.

A comparative analysis of the SECAPs of the seven UNCHAIN cities will be presented below, focusing on the strategies and objectives identified in the field of mobility and urban logistics.

5.3.1 Reference Years and Covered area.

Each UNCHAIN city has adopted a SECAP at different time, defining $CO_{2(eq)}$ emissions reduction targets by 2030 (and 2050) with respect to a selected reference year[22].
The following figure represents the year of the SECAP adoption by each city:

[22] Cities of Madrid, Prague and Mechelen adopted a city's climate plan that also serves as the cities' SECAPs, as defined by the joint initiative of European cities and towns acting under the name Covenant of Mayors for Climate & Energy.

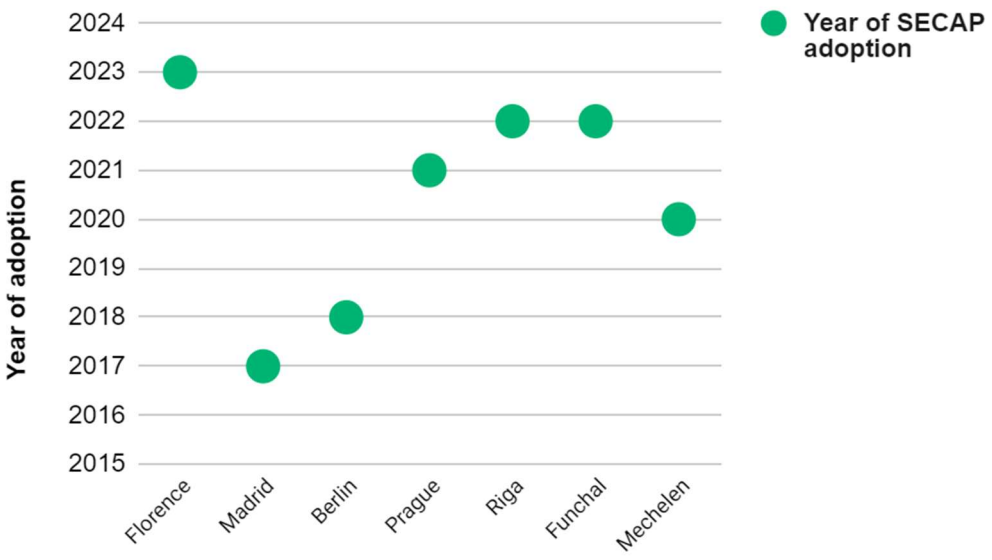


Figure 32 Year of SECAP adoption by city

Referring to the area covered, the Florence SECAP covers all the city boundaries except the airport. The Madrid SECAP refers to the whole municipal territory, as well as the SECAPs of Berlin, Riga, Funchal and Mechelen. The Prague SECAP covers the city administrative boundaries and the Central Bohemian region.

5.3.2 Objectives and ambitions.

In the following table information related to emissions reduction (both at a whole city level and at transport sector level) has been summarized. None of the SECAPs considered set quantitative targets specific to the logistics sector.

Table 9 SECAP emissions reduction targets

	Overall CO_2 emissions reduction target by 2030	Transport CO_2 emissions reduction target	Baseline Year
Madrid	-40%	-50% compared to 2012 emissions	1990
Florence	-60% The objective can reach up to 81% with unaccounted actions which, thanks to the application of the Climate City Contract.	-50%	2005
Berlin[23]	-60% -85% by 2050	-62% -85% by 2050	1990
Prague[24]	-45%	-4,7% It refers to private and commercial traffic (public transport not included)	2010
Funchal	-45% -86% by 2050	-50%	2010
Riga	-70%	-30% Compared to 2019 transport emissions	1990
Mechelen	-40% -80% by 2050	-57%	2011

- **Madrid:** The overall objectives of "Plan A" are to ensure health protection against of the effects of atmospheric pollutants, help in the fight against climate change by reducing greenhouse gas emissions (GHG), and strengthen urban resilience to climate effects. These objectives are crystallized in other more specific objectives as follows:
  - To meet European and national legislation regarding air quality.
  - To achieve air quality levels for particles in suspension in line with the guideline value of the World Health Organization (WHO).
  - To achieve by 2030 an over 40% reduction in total GHG emissions.
  - To fulfil the commitment to reduce GHG emissions caused by urban mobility by 50% by 2030 compared to 2012.
  - To develop a climate change adaptation strategy to reduce urban vulnerability to the risks associated with global warming.
- **Florence:** The Municipality is committed to achieving climate neutrality in 2030-2040 and to exceed the objective suggested by the European Commission for 2030, namely the reduction of CO_2 emissions higher than 60% compared to the base year, and to guarantee the development of greater capacity in the territory to address the effects of climate change. Florence aims at becoming:
  - A smarter city through innovation and digitalisation.

[23] The transport sector emissions and objectives also include emissions from the air traffic sector.
[24] The transport sector emissions and objectives also include emissions from the air traffic sector.

- A greener and lower carbon city thanks to the investments in energy transition, renewable energy and the fight against climate change.
- A connected city through investments in strategic mobility and transport and digital networks.
- A city that aims to develop sustainable mobility and ICT, as tools of inclusion and territorial cohesion.
- Environmentally friendly, integrated, internationally connected and supported by research and innovation.
- A city with a strong focus on the social aspect.

- **Berlin:** Berlin wants to be climate-neutral by 2050. The *Berliner Energie-und Klimaschutzprogramm 2030* (BEK 2030) sets forth roughly 100 measures for climate protection and climate change mitigation. The programme adopts a comprehensive approach that is based on practical measures, such as incentive programmes and the implementation of model projects, as well as overarching strategies, such as an improved supply of information on climate protection.
  The main objectives of the BEK 2030 are:

  - A minimum cutback on CO_2 emissions of 40 per cent by 2020, a minimum cut of 60 per cent by 2030 and an 85 per cent cut by 2050.
  - Cessation of energy generation from hard coal by 2030.
  - Further development of the agreements on climate protection with companies in the public sector.
  - Senate departments and borough administrations to be carbon-neutral by 2030.

  Regarding "Transport", the BEK 2030 strengthens public transport and improves the infrastructure for cyclists and pedestrians. Furthermore, the programme promotes electric mobility. The public vehicle fleet, used by the waste management department, the police, the public order office and others, will emit fewer pollutants and less noise in the future.

- **Prague:** The Prague's Climate Plan sets that the largest potential for reducing CO_2 emissions lies in replacing energy sources used for electricity generation. Newly constructed solar, water, zero- and low-emission power plants can fully power Prague without coal by 2030. The decarbonization of the heat production and supply sector aims to replace coal-generated heat with renewable and secondary sources, such as waste incineration, heat pumps, and cogeneration units using natural gas. Investments in energy-saving measures are expected to bring economic benefits, improve residents' quality of life, and save time. The focus on efficiency aligns with efforts to improve the overall quality and sustainability of life in Prague while reducing energy consumption and emissions.
  The plan aims to replace conventional energy sources with renewable sources such as solar, water, and low-emission power plants, contributing to a reduction in CO_2 emissions.

As for transport, the vision of the SECAP foresees “diversity of means of transport, attractive public transport, fewer cars on the streets and a healthier environment. At the same time (which is seemingly counterintuitive), this road type has higher carrying capacity than car-oriented thoroughfare. Most people find such streets more pleasant”. In relation to transport, a technologically and economically attainable goal is to lower the use of fossil fuels in transport within the territory of Prague by at least 25% compared to 2010.

- **Funchal:** As a vision for the future, Funchal's energy and climate policy will be oriented towards environmental sustainability, quality of life and well-being, knowledge and local economic competitiveness, through promoting efficiency, boosting the market for sustainable energy products and services, energy management and monitoring tools, promoting the principles of efficient use of resources and circularity, contributing to the creation of specialized jobs, added value and resilience to climate change. On the other hand, it is important considering that the specificities of an outermost island territory, without access to large continental energy networks, imply higher supply and conversion costs, making the implementation of energy efficiency measures and the valorisation of renewable energy sources more competitive, from an economic point of view, with high environmental and social benefits.
  With the implementation of all the plan's actions, the expected results exceed the commitments made for 2030, with an estimated increase of 170% in the contribution of renewable energy resources, a 51% reduction in the consumption of fossil fuels and a reduction of 45 % of carbon dioxide equivalent emissions. For 2050, more ambitious targets of reducing CO_2eq by 86% are defined.
  For what it concerns the transport sector, the high dependence on fossil fuels makes mobility one of the biggest challenges for decarbonization. The paradigm of sustainable mobility requires territorial management measures, a technological transition and a change in habits, requiring the requalification of infrastructure, renewal of fleets and a change in behaviour. With the aim of promoting sustainable mobility, actions have been defined to promote electric mobility and the use of alternative fuels, the transfer to public transport and soft modes, the rational use of individual transport and more efficient and clean logistics.

- **Riga:** Riga has set the target of becoming a climate-neutral city by 2030. The Riga City Municipality undertakes to implement the principles of climate neutrality in the municipal government’s infrastructure first, but also to work on the application of these principles throughout the city.
  The transport sector targets are as follows:
  - Aiming to lower the CO_2 emissions by 30% by 2030 in comparison to year 2019.
  - Lower private car user share in all transport users modal split by 5% by 2030 in comparison to year 2019.
  - Promoting the use of renewable energy sources in public transport (- 50% of vehicles powered by renewable energy sources by 2030).

- 100% of municipally owned transport powered by renewable energy sources by 2030.

- **Mechelen:** The action plan covers the period 2020-2025. However, the 2050 horizon should not be lost sight of, that is why a 2050 vision was formulated together with the residents and the services involved. According to the 2015 vision: "*Mechelen residents and goods move to and from the city and between communities through active and sustainable shared mobility and from mobility hubs. Everyone is mobile but not car-dependent. Alternatives are feasible*". The SECAP focusses on 4 themes:
  - Good air – reducing greenhouse gas emissions.
  - Cool city – map and reduce the consequences of rising temperatures.
  - Strong nature – minimalize the impact of drought on nature and agriculture.
  - Dry feet – actions to make Mechelen flood resistant.

5.3.3 Measures.

Transportation and Mobility is one of the most important sectors considered in a SECAP in terms of energy consumptions and emissions. In the following table the main SECAPs actions lines related to transport are summarised. Moreover, actions directly addressing the logistics sector are indicated.

Table 10 – SECAPs measures addressing mobility and logistic sectors.

City	Actions addressing transport and mobility sector	Actions addressing logistics sector
Madrid	The SECAP includes 21 transport and mobility actions targeting these objectives: • Reduction of the intensity of private motorized traffic: measures targeting the road network and public space to promote active modes of mobility (pedestrian and cyclist) and public transport. • Measures promoting low emissions technology: Promotion of electric mobility; Actions on emissions from strategic fleets (buses, taxis, municipal services fleets) and urban distribution of goods • Measures targeting private motorized cars: tax incentives and the gradual introduction of restrictions on access, parking, and the vehicles that pollute the most. Creation of a Central Zero Emissions Zone, with restricted access in which through traffic will be banned. • Production of a sustainable municipal mobility plan.	Loading and unloading bays management optimization through the development of a digital booking system tool (2017-2020). Urban freight distribution with low-emissions vehicles (2018-2025). Public-private collaboration for innovation and efficiency in urban logistics processes (2017-2020).

City	Actions addressing transport and mobility sector	Actions addressing logistics sector
Florence	The transport network modernization and mobility efficiency is a complex action aimed to reach important targets, as stated in the Florence SECAP. It includes 4 macro actions covering these measures: • E-mobility capital. • Public transport: local rails trams, new bus fleet, e-ticketing and infomobility, various sharing systems. • Eco-raodpricing – Green shield. • Soft mobility: pedestrian areas, bicipolitana. • Parking spaces control, park and ride and advanced intermodality. • Information technology: infomobility platform, traffic supervisor, APPs. • Communication campaign.	Setting a working table with the logistics operators (already in place with regular meetings and contacts). Efficient markets and logistics hubs: the city is committed to activating Micro-Consolidation Centers and to boost the use of lighter and greener for last mile distribution models (2024-2030).
Berlin	The SECAP includes 15 transport and mobility actions targeting these objectives: • Modal split: measures aimed at promoting active modes of mobility (pedestrian and cyclist) and public transport and mix transport. • Fuel and energy consumption reduction: include measures aimed at reducing speed, stabilizing the traffic flow and reducing the proportion of stop & go. • Measures targeting private motorized cars: parking management, mobility management. • Foster alternative fuels.	Strengthening the transport mix in freight transport: this action promotes switching from road transport to rail and water freight transport, reduce the proportion of empty trips, creation of UCC and micro-depots, creation of logistics-intended areas and a range of natural gas/biogas filling stations for high compression gas for heavy commercial vehicles. (A "micro-hub" has already gone into operation at Tempelhofer Damm. New concepts for the increased use of rail for urban logistics are being discussed).
Prague	Prague's SECAP identifies 5 core priorities in transport sector (further developed in 20 actions): • Reducing the intensity of motor vehicle transport (especially in the central areas of the city). A highly sensitive question of tolls and parking permits has a clear answer in term of reducing the carbon footprint. • Increasing the attractiveness, capacity, and effectiveness of public transport. The expansion of the metro and tram lines and the integration of train transport has the potential to make public transport the best way to travel around the metropolis. • Increasing the attractiveness, capacity, and effectiveness of non-motorised transport.	Using self-service parcel boxes to reduce the number of kilometres driven by lorries and vans. Depots based in strategic locations can be used to move parcels from lorries to couriers on foot, or to cargo bicycles. On-foot couriers and cargo bikes can be used to cover the so-called last mile of deliveries (A depot for electric bikes has been operating since November 2020 in Prague-Florenc, helping to reduce the number of delivery trucks on streets.) Incorporating railway and river transport into city logistics. Transformation of cargo vehicles into low and zero emission standards

City	Actions addressing transport and mobility sector	Actions addressing logistics sector
	• Support the development of sustainable air travel. The conservative goal set by the Climate Plan for air travel in Prague is to reduce CO_2 emissions before 2030 by 15% in comparison to the situation in 2010. • Substitute vehicles using conventional fuels with low and zero emission alternatives Battery powered electric buses and trolleybuses, hydrogen powered vehicles, emission-free cleaning and garbage trucks, etc.	Coordinating the ways of supplying the city with necessary goods and services (the city can aid with the development of so-called "light and electric city logistics").
Funchal	Funchal's SECAP includes 6 macro-actions addressing mobility and transport with the following objectives: • Promote electric mobility and the use of alternative fuels (including green hydrogen), starting from the public service fleets and the taxi fleets and consolidating the EV charging network. • Switch to public transport and soft transport modes, acting both on the efficiency and the attractiveness of the service and offering fair tariffs. • Promote the rational use of individual transport by improving the pedestrian infrastructures and by creating free cars zones. • Promode modal-split, also through dedicate parking policies. • Optimization of urban logistics.	Define rules for using public space for logistics s (last mile), including types of access, operating hours and efficient management of loading and unloading places (2021-2030). Promote the adoption of management tools for logistics operations and the introduction of cleaner forms of energy, to optimize services, improve energy efficiency and reduce pollution (2021-2030). Promote electric vehicles in urban micro logistics (2021-2030).
Riga	A total of 15 measures have been identified in the transport sector. These are grouped in four macro-categories: • Initiatives to reduce the need to travel (like the practical implementation of the concept of mobility points, the introduction of smart traffic management technologies, and other measures) • Initiatives to transition from private cars to less polluting modes of transportation: including the promotion of mobility on foot and by bicycle, the implementation of a low-emission zone, Regular reviews of the car park policy (fees and location), etc. • Initiatives to Increase the Share of Renewables in Transport: including actions aimed at the electric vehicle charging infrastructure development integrated with the production of renewable energy and innovative solutions for using energy storage potential, support for the purchase of electric vehicles, low-emission water transport in Riga. • Horizontal Measures: including actions aimed at creating a system for regular data collection and information analysis, and at developing the use of	Assessment of the impact of delivery transport (e.g., Bolt, Wolt, DPD, Latvijas Pasts) on CO_2 emissions in Riga, possible solutions for reducing CO_2 emissions, cooperation between the municipal government and businesses.

City	Actions addressing transport and mobility sector	Actions addressing logistics sector
	modelling tools for predicting future trends in the transport sector.	
Mechelen	A total of 6 measures have been identified in the transport sector: • Action to promote soft transport modes on foot and by bicycle, making major investments in walking and cycling infrastructure. • Promotion of public transport. • Foster sharing mobility. • Development of the EV charging stations infrastructures and enlargement of the car free zone. • Optimizing urban distribution. • Planning for a sustainable mobility.	Distribution: Optimize urban distribution together with logistic partners, short chains, cycle logistics, autonomous vehicles, consolidation of goods, lockers, alternating UVARs, transportation via rail and more efficient construction logistics. Sustainable last mile deliveries (specific to the city as an organisation): the aim is 3 deliveries/week (be an example for sustainable deliveries - all goods are delivered in a city depot and transported to the city by a bicycle courier, low impact).

5.3.4 Baseline emissions and energy consumption.

In the following table, the energy consumption and CO_2 emissions in the baseline years, related both to the whole municipality territory and to the transport sector, have been reported for the seven UNCHAIN cities:

Table 11 –Total energy consumption and emissions and energy consumption and emissions from the transport sector in the Baseline year

	Total energy consumption in GWh	Transport energy consumption in GWh	Overall CO_2 emissions in kTonn	Transport CO_2 emissions in kTonn
Madrid	45.801	9.888	13.565	3.486
Florence	8.641	3.355	2.524	862
Berlin	72.554	17.033	29.367	5.023
Prague	24.324	7.039	8.844	1.838
Funchal	1.341	687	511	178
Riga	19.401	2.577	4.107	630
Mechelen	1.828	317	395	80

The transport sector is particularly energy-intensive and emissions-intensive in the city of Funchal, where it represents the 51% of total energy consumption and the 35 % of total emissions, in the city of Florence where it's responsible for the 39% of total energy consumption and the 34% of total emissions, in the city of Prague, where it accounts for the 29% of total energy consumption and the 21% of total emissions and in the city of Madrid, where it represents the 22% of total energy consumption and the 26% of total emissions. In Berlin, Riga and Mechelen the transport sector accounts for less than the 20% of total emissions (respectively the 17%, the 15% and the 14%).

Municipalities signing up to the CoM commit to submit monitoring reports on a two-years basis including status of the implementation of actions and - at least every fourth year - a

monitoring inventory which allows to measure progress toward the targets set in the action plan. Monitoring inventories enable to track the evolution of CO_2 emissions in local authorities' territories as well as changes in energy consumptions patterns, and to compare estimated impacts of the actions against actual results.

Cities of Madrid, Berlin, Florence, Riga and Mechelen have already carried out one or more monitoring of their SECAPs, assessing the energy consumption and emissions trend within their boundaries. In the following table, the main results related to the last monitoring fulfilled are reported.

Table 12 CoM results monitored.

	Energy and Emissions Monitoring Inventory Year	Results already monitored			
		Overall energy reduction	Transport Energy reduction	Overall CO_2 reduction	Transport CO_2 reduction
Madrid	2014	n/a	n/a	-23,8%	-9,2%
Florence	2019	-30%	-44%	-32,7%	-48%
Berlin	2012	-0,4%	+8%	-29%	-2%
Riga	2020	-46%	+13,8%	60%	+14%
Mechelen	2019	-8%	+2%	-10%	0%

If we consider the overall energy consumption and emissions, it emerges that all the cities have registered a reduction, but mobility sector turns out being the most challenging sector when it comes to reduce its environmental impact. In fact, the city of Riga has registered an increase in transport emissions over a period of 10 years, while in Berlin and Mechelen, although transport emissions have reduced -in Berlin- and stayed stable -in Mechelen- related consumption has increased from the Baseline year to the monitoring one.

5.3.5 Monitoring.

In order to assess the actions' progress, is important to select some specific KPIs. From the analysis of the questionnaires and the SECAPs, it results that most of the cities have adopted only the CO_2 emissions as monitoring indicator for the transport sector, reserving the possibility to select further specific indicators during the monitoring periodical phase. Only Riga and Florence have selected and listed different KPIs to assess the action implementation:

Table 13 SECAPs indicators related to transport and mobility sector.

Transport-related Monitored Indicators	Cities
CO_2 yearly emissions	All SECAPs
Average fuel consumption by vehicles	Riga
Average age of vehicles	Riga
Traffic flows leading to the city	Riga

Number/Map of publicly available fuel/charging stations for electric vehicles and other alternative fuels	Riga, Florence
Amount of fuel sold at fuel stations	Riga
Share of private vehicle users of the total traffic volume	Riga
The number of registered and vehicles in good technical order, broken down by fuel type and age, incl. electric vehicles and other alternative fuel vehicles	Riga, Florence
Km of cycle paths	Florence
Modal shift towards soft mobility (qualitative data to be collected through surveys)	Florence
Km^2 of pedestrian areas	Florence
Total surface trend of the Limited traffic zones	Florence
Number of Mobility APPs users	Florence
N. of available sharing vehicles/100.000 inhabitants	Florence
MWh of biofuels consumed	Florence

5.4 Best practices

For a comprehensive list of best practices, the database investigating CIVITAS projects' solutions has been made available to project partners.
Another source of inspiration is the Guide for advancing toward zero-emissions urban logistics at 2030 published by POLIS and ALICE[25]; the guide has identified five key areas of intervention to address the challenges associated to urban logistics:

1. Smart governance & regulations
2. Clean & alternative fleet
3. Logistics operations
4. Purpose oriented data acquisition and sharing
5. Consumer engagement

Concerning the participating cities, some best practices already implemented and under monitoring have been detected in the analysis and will be further investigated in a bench-learning exchange during the project when SULP will be developed/updated.
Hereafter a first list of interesting experiences from partner cities and their results (monitored or expected):

[25] https://www.etp-logistics.eu/wp-content/uploads/2021/12/POLIS_ALICE_Guide-Zero-Emission-Urban-Logistics_Dec2021-low.pdf

Table 14 First best practices detected

City	Best practice	Results and lesson learned/Expected outcomes	Included in
Berlin	Prioritise sustainable mobility	In 2018, the Berlin Mobility Act, was passed, providing the basis for a realignment of the city and mobility strategy by prioritizing environmentally-friendly modes of mobility over motorized individual transport. This policy, which is a bold rejection of the car-centric city, has been the foundation for Berlin's overarching urban planning strategy.	Berlin Mobility Act
	Cluster Transport, Mobility and Logistics Berlin-Brandenburg	The cross-border Cluster Transport, Mobility and Logistics (CTML) was founded in 2011 by the two German federal states Berlin and Brandenburg with the sole purpose of implementing the mobility-related policy objectives. Since its establishment in 2011, the cluster contributed to significant employment and revenue growth in the region and initiated various R&I projects with a particular focus on digitalisation, electrification and upskilling. Of the 86 running R&I projects in 2021, individual projects stand out that can be assigned to the innovation field of automation and networking and at the same time have the character of regulatory test beds and testing areas – i.e., in addition to technical testing, they also address the need for regulatory action.	joint innovation strategy innoBB 2011
	Urban micro-hub	Five logistics companies shared an urban micro-hub, delivered 160,000 parcels in an area of 2-3 kilometres reducing emissions and noise levels and double parking.	Komodo project
	Cargo-bikes	Berlin created pop-up bike lanes after COVID-19 hit in March 2020, a decision which has supported cargo-bike deliveries. The district of Neukölln has been redesigning public spaces to improve accessibility. This has included opening new areas for cargo bike parking and modifying e-scooter parking regulations. The city and its districts have created also a platform for entrepreneurs and non-profit organisations to use shared	"fLotte Berlin" project

City	Best practice	Results and lesson learned/Expected outcomes	Included in
		car-go bikes for free in order to incentivise a modal shift.	
	Platform Commercial Transport	In 2015 has been established in Berlin a private logistics platform and road freight marketplace, connecting commercial shippers with a range of local delivery services	Private initiative
Florence	EV charging infrastructure	Public charging infrastructure with more than 200 charging stations	Smart City Plan, SUMP, SULP
	e-taxi fleet test with dedicated fast recharge and facilitations	An e-taxi fleet of 100 vehicles has been created with savings of about 110 t CO_2 per year	H2020 Replicate project
	Smart City Control Room and App IF for multimodality and traffic congestion	Creation of a modern traffic management center (integrated into the SCCR) capable of providing real-time information on traffic situations, critical issues and redesigning alternative routes, connected to the information portal (the web and real-time messaging panels). The IF - Infomobilità Firenze webApp, capable of collecting all the information in real time on the transport network including both scheduled (public works) and unexpected events (e.g. accidents) that influence the operating conditions of the network and conveying all information in a simple and effective way to support users in their daily travel choices.	SUMP
Madrid	Decarbonisation of logistics in Mercamadrid	the largest platform for the distribution, marketing, transformation and movement of fresh food in Spain.	CIVITAS project Eccentric
	MOMENTUM decision support tools	Co-design and stakeholders' engagement for the definition of more than 300 new bike-sharing stations and 3,000 new bikes are set to be deployed in Madrid's streets over the course of the next few years	Civitas project MOMENTUM
	Low emissions zones	The 604 km^2 that make up the territory of the capital will be declared a LEZ in 2025. The progressive implementation began the 1st January 2022.	SUMP and Madrid 360 Strategy
	Logistics micro-hub	Two logistic micro-hubs have been already activated (Plaza Mayor and Canalejas)	SUMP
	Digital platform for Loading and Delivery Zones management	Development of a cost-effective platform to control, regulate, and monitor multi sustainable digital loading and delivery zones for city	S+LOADZ project

City	Best practice	Results and lesson learned/Expected outcomes	Included in
		logistics, to accelerate the shift to sustainable and smart city logistics.	
	Global IT platform for e-mobility	Set up of a global platform for shared, public and commercial e-mobility solutions to kick start the transition towards low-carbon urban mobility. It encompasses city level demonstrations to test different types of innovative and integrated e-mobility solutions, complemented by a comprehensive toolbox, capacity development and replication activities.	UN environment programme project "SOLUTIONS+"
	Returned godos management	Analysis on how to best adapt the logistics industry to account for returns as well as deliveries, reducing the amount of trips and increasing efficiency.	LogiCycle
Mechelen	UVAR	City of Mechelen has UVAR since 2011 with the installation of a circulation plan, timeframes for deliveries, car free zones and a prohibition on heavy goods vehicles larger than 10 tons and longer than 11 meters	
	Sustainable Last mile transport	Creation of an Innovation Transferability Platform comprising Digital Twinning Tools, open models, smart contracts governed by blockchain technology and a data-driven Impact Assessment Radar. Mechelen, as a follower city, will carry out feasibility studies of the innovations' adoption (sep 22-feb 26)	Horizon URBANE project
	Data-based solutions	Definition of innovative solutions to improve public service delivery using data in mobility, energy, and clean environment. Development of innovative procurement methods to work with businesses in developing data-based solutions.	Interreg 2 Seas "SCIFI" project
	Decision support toolbox and cargo hitching	From Monday the 13th of June to Friday the 12th of August 2022 a first autonomous driving shuttle was tested in Mechelen, transporting up to 8 people as well as postal packages. The vehicle covered 2.5-kilometre route on weekdays on the Mechelen Noord industrial estate.[26] Besides that, the development of a methodology for effective multi-	CIVITAS project "ULaaDS"

[26] https://ulaads.eu/first-autonomous-shuttle-on-public-roads-runs-in-the-ulaads-mechelen-trial/

City	Best practice	Results and lesson learned/Expected outcomes	Included in
		stakeholder collaboration, involving the whole urban logistics ecosystem is envisage as well as the creation of a decision support toolbox helping developing SUMPs and SULPs processes (sep 20-feb 24).	
Prague	Cargo bike depot	In 2020 the city started a pilot scheme of Cargo bike depot (Těšnov), second branch followed in 2021 (Anděl)	SECAP
	B2G data sharing	App My Prague that offers to residents and visitors either static city information or dynamic data such as data from traffic cameras. The cooperation with ride-hailing and bike-sharing companies allows extending provided information. The app is linked to the city data platform Golemio.	
Riga	Bookable curb spaces	Digital platform which (i) offers bookable loading zones, (ii) introduces pricing, incentives and regulation enforcement, (iii) will be tested using camera monitoring to gauge user acceptance.	EIT Urban Mobility
Funchal	ITS tools to support suppliers	Implementation of dynamic curb side management solutions (platform for digitalisation of logistics parking rules, mobile app to locate parking zones and access regulations for cargo personnel) to improve street safety and better use of public realm while optimising delivery operations.	EU projects, such as MATCH-UP and FlexCurb

6 Conclusions.

The deliverable has tried to summarise the huge amount of information available to illustrate the partner cities' context and provide following tasks with materials for further analysis.

Hereafter, to complete the overview of the main barriers and opportunities already illustrated in paragraph 3.2, some first recommendations are provided, classified into the same 5 categories, and the first results from best practices collection.

6.1 Legal and institutional.

In this category most of the challenges pointed out by the cities could benefit from project outputs: the ICT tools to be developed will support the control on parking areas and the

definition of a strategic plan where not already available together with the capacity building of the involved municipalities.

More difficult is the compliance with cultural heritage issues, which could be mitigated by the dynamic use of available spaces and by a synergic development of urban planning tools and cooperation with the competent authorities.

It must be taken into account that national legal frameworks can have a big influence: fluctuating regulatory regimes or the incoherence between local and national regulations must be prevented by a closer cooperation in a multi-level governance model of sustainable policies.

6.2 Infrastructural.

Both mobility as well as technological infrastructures are fundamental for the development of sustainable logistic: beside their maintenance and construction works that require more and more investments and coordination, for those issues which are most difficult to solve, like the lack of spaces and traffic jams/congestion, the project will test supporting tools for the dynamic use of spaces and the optimisation of trips and accesses to pilot areas.

In case of technological services and infrastructure, a crucial point is the interoperability of the systems which could be supported by the use of internationally recognised standards: thanks to the intrinsic characteristic of a "technical standard", it can be used as risk reduction tools as based on universal criteria of transferability, essentiality, transparency, sharing …

For the issues related to access policies and the management of tourist flows some interesting best practices have been made available by the partner cities.

6.3 Data management

Availability, access and security of data, is another important challenge, common to most of the partner cities. It can be applied to public sector itself, but it becomes even worse at inter-sectorial level when promoting a public-private cooperation. In this case, some examples of agreements to facilitate the data governance & exchange, as well as the regulatory compliance are available from other experiences (for example the Digital Manifesto promoted by Florence to support the Smart City Control Room). Cooperation between stakeholders is critical for successful implementation of city logistics projects and data management (shippers, freight carriers, administrators, commerce and manufacturing sectors, HORECA, residents…) and will be further tested in the living labs.

6.4 Economic & social acceptance

The project will look for business models that could foster innovative logistics concepts to continue beyond the pilot period and for the positive acceptance of new concepts by citizens and users. Beyond favourable regulations and the general market situation, a positive contribution could be brought by the definition and promotion of co-benefits and external costs which could be very supportive in the communication activity and sometimes also in the definition of "advanced" comprehensive business analysis).

6.5 European best practices

During the project meeting in Florence an on-line survey has been lunched to start matching the best practices with the obstacles detected.

As shown in the graphic below, several solutions (about 20) have been proposed by partners for almost all the main challenges highlighted by the cities.

The idea is to keep the database as a living document to be continuously optimised, also in the user-friendliness and project partners' solutions details, closely linked to the existing platforms of the main EU initiatives.

The best practices proposed will be further analysed in the design of the demo sites solutions.

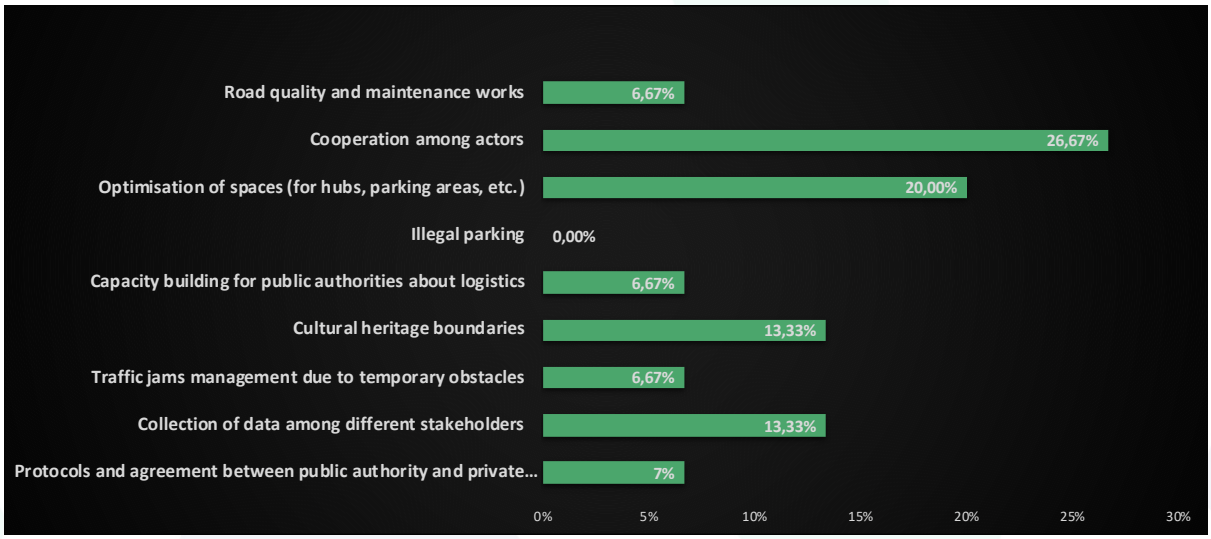


Figure 33 Solutions from experience/other projects proposed by partners to overcome main obstacles.

7 References.

- Partner cities' and logistic operators' UNCHAIN WP2 questionnaires
- Madrid
  - SUMP 2022 https://sede.madrid.es/csvfiles/UnidadesDescentralizadas/UDCBOAM/Contenidos/Boletin/2022/Anexos%202022/3.1.%20Anexo%20Madrid%20360%20BOAM_.pdf
  - SECAP Plan A: Air quality and climate change https://www.madrid.es/UnidadesDescentralizadas/Sostenibilidad/CalidadAire/Ficheros/PlanAire&CC_Eng.pdf
  - Madrid 360 Strategy definition https://www.madrid360.es/wp-content/uploads/2021/09/Avance-Estrategia-Sostenibilidad-Ambiental-Madrid-360_baja.pdf
  - Estudio de viabilidad para el desarrollo de soluciones logísticas, Ayuntamiento de Madrid (2016 - 2017)

- Berlin
  - SUMP Stadtentwicklungsplan Mobilität und Verkehr (StEP MoVe) https://www.berlin.de/sen/uvk/mobilitaet-und-verkehr/verkehrspolitik/stadtentwicklungsplan-mobilitaet-und-verkehr/
  - SULP Integriertes Wirtschaftsverkehrskonzept (IWVK) https://www.berlin.de/sen/uvk/mobilitaet-und-verkehr/verkehrspolitik/integriertes-wirtschaftsverkehrskonzept-iwvk/
  - Berlin Mobility Law https://www.berlin.de/sen/uvk/mobilitaet-und-verkehr/verkehrspolitik/mobilitaetsgesetz/
  - The Berlin Climate Protection and Energy Transition Act https://www.berlin.de/sen/uvk/klimaschutz/klimaschutzpolitik-in-berlin/energiewendegesetz/
  - Inhabitants in Berlin Statistical Report https://download.statistik-berlin-brandenburg.de/1ed2bda91b255dd1/9efa16b6afd4/SB_A01-05-00_2023h01_BE.pdf
  - Population Development https://www.berlin.de/sen/sbw/stadtdaten/stadtwissen/bevoelkerungsprognose-2021-2040/
  - Land use https://www.berlin.de/umweltatlas/en/land-use/
  - Environemntal Zone https://www.berlin.de/sen/uvk/umwelt/luft/luftreinhaltung/umweltzone/
  - Socio economic indicators https://www.berlin.de/sen/finanzen/vermoegen/geld-und-kreditgeschaeft/2022-12-13_fitch_rating-report_state-of-berlin.pdf
  - The 2030 Federal Transport Infrastructure Plan, Federal Ministry of Transport and Digital Infrastructure (August 2016)

- Florence
  - SULP https://www.cittametropolitana.fi.it/puls/
  - SUMP https://www.cittametropolitana.fi.it/pums/pums-approvato/
  - STATISTICS https://www.comune.fi.it/statistica
  - ENVIRONMENTAL PLANS (Air quality, Acoustic, SEAP/SECAP, Smart City Plan…) https://ambiente.comune.fi.it/pagina/sostenibilita-ambientale
- Funchal
  - SECAP https://eu-mayors.ec.europa.eu/en/signatory/14003
  - PIETRAM https://civitas.eu/resources/plano-integrado-estrategico-de-transportes-da-regiao-autonoma-da-madeira-pietram-20142020
  - Measure Evaluation Result MAD 5.1 – Smart and Clean Urban Freight Logistics at Tourist Destinations https://civitas.eu/sites/default/files/mer_mad5.1_24052021_final.pdf
  - Funchal economic bulletin https://www.funchal.pt/wp-content/uploads/2023/03/01_Boletim_Economico_do_Funchal_03.2023.pdf

Funded by the European Union

- Mechelen
  - SUMP https://drive.google.com/file/d/1TCTfDf2JzZZ-_IaWs3MHXikIO2PeHauj/view
  - Provincie in cijfers https://provincies.incijfers.be/dashboard/dashboard/
  - Mechelen in cijfers https://mechelen.incijfers.be/dashboard/dashboard/
  - Klimaatactieplan SECAP https://klimaatneutraal.mechelen.be/klimaatactieplan-mechelen-
  - Emissie inventaris 2019 https://www.mechelen.be/commissie-12-januari-2022-bijlage-1
  - Mechelen Spatial Policy Plan https://www.mechelen.be/beleidsplan-ruimte-mechelen-ontwerp-analyserapport-werkende-stad
- Prague
  - 2022 Technical Road Administration Report www.tsk-praha.cz
  - Prague 2030 Climate Plan (also serves as the city's SECAP https://mycovenant.eumayors.eu/document/document-download?id=790034&filename=NHQZKTK90j3RfBPzcPHiFIMQEHm1xLFO.pdf
  - Catalogue of Open Data https://opendata.praha.eu/
  - Prague's population statistics: https://iprpraha.cz/page/3415
  - Data Platform managed by Golemio https://golemio.cz/ and https://operatorict.cz/
  - Land Use Analysis and Database by the Institute for Planning and Development. uap.iprpraha.cz
  - Prague's Logistics Study by the Institute for Planning and Development https://iprpraha.cz/page/3997/city-logistika
  - Smart Prague https://smartprague.eu/files/2021/SPI_ROCENKA_2021_EN.pdf
  - Sustainable Mobility Plan https://poladprahu.cz/wp-content/uploads/2019/11/Mobility_Plan-Brochure_EN.pdf
- Riga
  - RVC AZ current functional zones SN_EsosaIzmantosanaQ.mxd (rdpad.lv)
  - Sustainable Energy and Climate Action Plan d93f78a3385c6105d12eb0a6059d38b323c2095f.pdf (riga.lv)
  - Riga Sustainable Development Strategy until 2030 https://www.rdpad.lv/wp-content/uploads/2014/11/ENG_STRATEGIJA.pdf
  - Action Plan for Decreasing Air Pollution in Latvia 2020-2030 https://likumi.lv/ta/id/314078-par-gaisa-piesarnojuma-samazinasanas-ricibas-planu-2020-2030-gadam
  - Central Bureau of Statistics DatabaseThe database for general data in various topics https://stat.gov.lv/en/statistics-themes
  - "Note on Riga Spatial Structure" By Alain Bertaud
  - GDP data: https://stat.gov.lv/en/statistics-themes/economy/national-accounts/press-releases/15024-gdp-regions-2020?themeCode=IK
  - Espon Mista Project, Case study report: Riga (LV) https://www.espon.eu/sites/default/files/attachments/ESPON_MISTA_Annex_3.3_Case_Study_Riga_0.pdf
- Guidelines for developing and implementing a sustainable urban mobility plan (2nd Edition) – 2019
- ENCLOSE GUIDELINES – Developing and implementing a Sustainable Urban Logistic Plan – 2015
- Guide for advancing towards zero-emission urban logistics by 2030 (2021 - POLIS, ALICE)
- Policy options to reduce emissions form the mobility sector: inspiring examples and learning opportunities. (Covenant of Mayors)

- Solutions that Tackle Congestion and Improve Goods Distribution: Success stories and results from CIVITAS Research and Innovation Actions (2023 - Civitas)
- URBAN FREIGHT LOGISTICS SOLUTION BOOKLET (Smart Cities Marketplace 2023)
- Urban Logistics. How to unlock value from last mile delivery for cities, transporters and retailers. Arthur D. Little Future of Urban Mobility Lab, May 2015
- Road Freight Lab, A Low Carbon Freight report under WBCSD's Low Carbon Technology Partnerships initiative (LCTPi) WBCSD (2017)
- Smart Freight Centre (2017)
- The future of urban freight transport: Enabling data sharing to support decision-making, Yiqian Zhang, Sustainable Mobility Officer, ICLEI World Secretariat https://sustainablemobility.iclei.org/the-future-of-urban-freight-transport-enabling-data-sharing-to-support-decision-making/
- Civitas projects database https://civitas.eu/projects?date=1

Annex I. SULPs/SUMPs/SECAPs measures summary

The UNCHAIN cities have adopted different planning documents - namely the SUMPs, the SULPs and the SECAPs - with the aim to define an effective strategy and to identify the most appropriate actions to regulate transport and logistics sectors with the final objective of pursuing the environmental sustainability, the liveability of the urban space and, more in general, the well-being for their citizens. In the table below, an overview of the planning documents in force and the related year of adoption by the Cities' Councils is represented:

Table 15 Plans adopted by the UNCHAIN cities.

	MAD	FLO	BER	PRA	RIG	FUN	MECH
SULP [27]	2022	2023	2021	2019	-	2019	2020
SUMP	2022	2020	2021	2019	-	2018	2015
SECAP	2017	2023	2018	2021	2022	2022	2020

With the purpose of easing the consultation of the main measures addressed to the logistics sector contained across the UNCHAIN cities' planning documents, a table summarizing the main types of actions embedded in the cities' Plans has been created.

The actions have been condensed in 33 actions-type split by the categories already indicated in paragraph 5.1.3 of the deliverable. Moreover, the planning document containing each single action has been specified:

● indicates an action included in the SULP.
▼ indicates an action included in the SUMP.
◊ indicates action included in the SECAP/other documents.

Table 16 List of the logistics sector-related actions included in the Cities' planning documents.

	MAD	FLO	BER	PRA	RIG	FUN	MECH
Technical measures/Operations measures							
Increase the number of cargo bays/Improve their location	●	●	●	●		●	◊
Information on occupation of the cargo bays	●		●			▼	
Micro-hub/Micro depots increase and enhancement	●	●	●	▼		●	
Night UFD	●						
Lockers	●	▼		▼			

[27] Grey-coloured boxes indicate those cities which, despite having not a SULP, have carried out an analysis about logistics sector.

Funded by the European Union

	MAD	FLO	BER	PRA	RIG	FUN	MECH
Last mile delivery enhancement				●			▼
Infrastructure measures/Clean and alternative fleet							
Clean vehicles for UFD and EV charging stations	●	●	●	●		●	◊
Evaluate and facilitate optimal locations for logistic centres	▼			●			
Use of drones		●					
Urban freight delivery by rail		●		●			
Cargo bikes and parking facilities for cargo bikes		●	▼				▼
Use of water ways for site logistics			▼	▼			
Creation of a range of natural gas/biogas filling stations for high- compression gas for heavy commercial vehicles (e.g. business premises)			◊				
Implementation of UCC						●	◊
Maintenance and redevelopment of infrastructures (e.g. bridges)			▼				
Policy-based measures/Smart Governance & Regulations							
Extend the cargo bays schedule	●		●			●	
Specialised vigilance of parking breaches within the cargo bays.	●						
Consider logistics in all planning documents		●	●				
Designing a main route network for large and heavy transport			●				
Support/grant programme for cargo bikes and other environmentally friendly transport modes			▼	●		●	
Reform of the city transport administration (more effective management, coordination of investments and implementation of the principles of integrated transport planning)				●			
Toll system implementation				●			
Restriction or prohibition of freight activities in areas located in the main nodes/ Implementation or expanding of LTZ					●	●	◊
Public-private collaboration for innovation and efficiency in urban logistics processes	◊						
Avoiding delivery operations where schools are located at the start and end of school hours							◊
Collaboration agreement among the City administration and the logistics stakeholders/Permanent forum	●	●	●		◊	●	▼
Purpose oriented data acquisition/ICT application							
ICT solutions for access, booking, data collection and planning support (city data platform) in a smart city logic.		●				●	
Intelligent Loading and Unloading/Booking system	●	▼				●	

	MAD	FLO	BER	PRA	RIG	FUN	MECH
Set Key Performance Indicators							◊
Soft measures/Consumer engagement							
Promote the importance of urban logistics and create awareness			●				◊
Creating a job position Specialist for freight transport				●			
Social responsibility and customer preferences as driving force to reduce environmental impact of logistics activities				▼			
Awareness campaigns geared at freight operators and local trader to improve last mile operation and driving						●	◊

As shown in the table:

- 11 are Policy-based/Smart Governance & Regulations measures;
- 9 are Infrastructure/Clean and alternative fleet measures;
- 6 Technical/Operations measures;
- 3 Purpose oriented data acquisition/ICT application measures;
- 4 Soft/Consumer engagement measures.

The 4 main common actions are:

- Increasing the number of cargo bay and improve their location.
- Use low impact vehicles and implement an adequate EV charging stations infrastructure.
- Set collaboration agreement/permanent forum between city administration and logistics stakeholders.
- Creation of Micro hub and micro depots for last mile delivery.

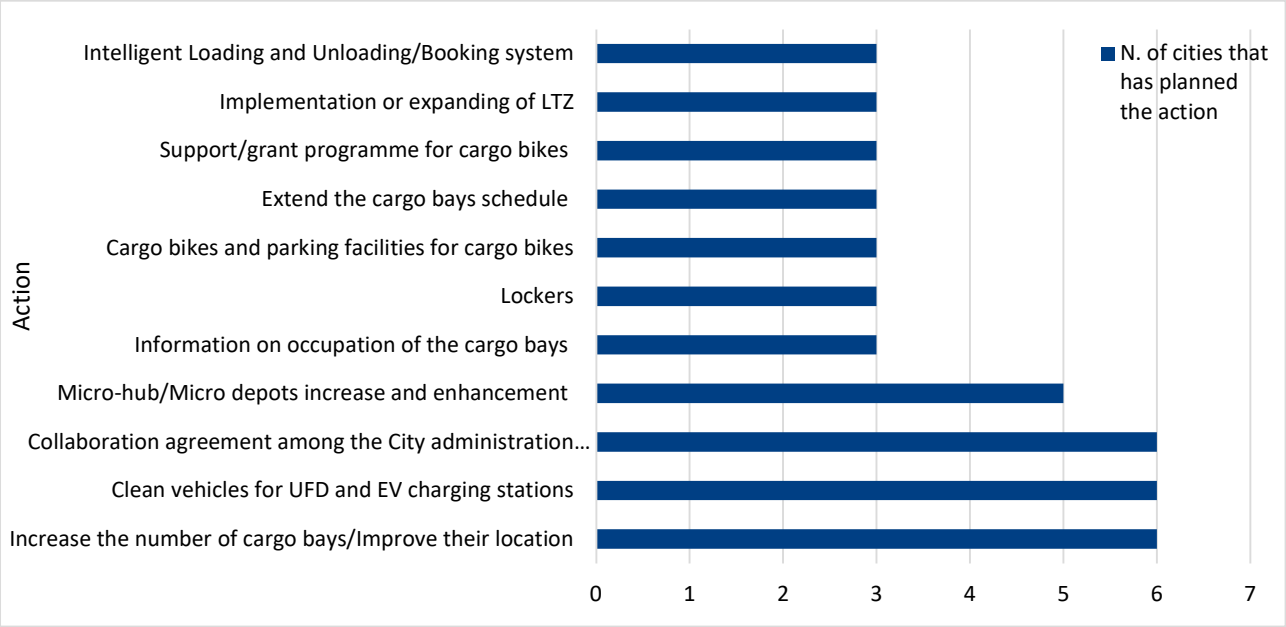


Figure 34 Most common logistics-related actions in the Cities' plans

These actions respond to the main challenges identified by the 7 cities (as already analyzed in chapter 3 of the deliverable) linked above all to the lack or poor collaboration between Cities administrations and logistics operators, to the limited data-sharing among the involved actors, and to the road congestion problems that afflict urban centers with all the negative impacts on environment, safety and livebility.

Annex II. KPIs: indicators used by the cities and by the logistics operators.

This paragraph is intended to offer a general overview about the main indicators adopted by the cities to assess the progress of the actions planned/carried out to improve the logistics sector management and to reduce its negative impact within the city.
The symbol ● indicates the KPIs reported in the planning documents (SULPs, SUMPs, SECAPs) while the symbol ▼ indicates the KPIs listed by the cities in the questionnaire (provided under the optional question "Monitoring data").

Table 17 List of KPIs monitored by the cities (source Cities' planning documents and answers to the questionnaire)

	MAD	FLO	BER[28]	PRA[29]	RIG	FUN	MECH[30]
	Operations						
Light commercial vehicle mileage/ Distance travelled by freight vehicles		●			●	●	
Loading/unloading time (sensors or empirical observation)	▼	●				▼	

[28] The actions' progress of Berlin will be evaluated during the monitoring of the planning documents and performance indicators will then be calculated. Nevertheless, the SULPS provides some statistics related to Courier, express, parcel and postal services which may be probably monitored during the next actions' progress assessment:

- N. of daily consignments;
- N. of vehicles driving daily in the morning between 8:00 am and 10:00 a.m;
- The average daily mileage per vehicle;
- Average number of shipments per vehicle distributed on pure parcel tours;
- Average time vehicles remain stationary and in fine range during the operating time from stop to stop (the so-called "milk run");
- Average number of stops in the dense inner-city areas, and average n. of consignments delivered per stop;
- Absolute n. of shipments.

Regarding Oversized and heavy transport (GST) in Berlin (exceed the maximum dimensions of the Road Traffic Licensing Regulations (StVZO), of 2.55 meters wide, 4.00 meters high and 18.75 meters long, 40 tons) statistics are provided related to:

- N. of GST journeys per year;
- N. of notices or approvals issued in the "Procedure Management for Oversized and Heavy Transports" (VEMAGS).

[29] No evaluation measures of the objectives proposed in the Prague's Logistics study have been carried out. Anyway, the study proposes some indicators to be monitored and that could be included in the future SULP:

- Number of designated loading zones within Prague.
- Number of locations designated for parcel locker installation.
- Number of spaces rented as micro-depots.
- Number of railway sidings within Prague.
- Number of ports with freight capability within Prague.
- Number of partners engaged in the city logistics planning process.

[30] No indicator set yet. However, one of the actions included in the pact entitled "Sustainable and Efficient Urban Logistics in Mechelen" is aimed at defining a list of KPIs for the logistics sector.

Funded by the European Union

	MAD	FLO	BER[28]	PRA[29]	RIG	FUN	MECH[30]
Number of micro platforms	●						
Number and distribution of loading & unloading areas	●				▼	▼	
Number of lockers	●						
% delivery vehicles from 22h to 7h/total	●						
Ratio between the total time spent on a congested road network and the total "virtual" time spent in the absence of congestion.		●					
Freight logistic intensity (Traffic counts through car plates)						●	
Average age of freight vehicles	▼					●	
Number and typology of registered logistics vehicles entering the Low-emission zone (LEZ) and the entire city territory					●		
Revenue from LEZ access fee (EUR)					●		
N. of logistics vehicles split by fuel used	▼				▼		
N. of commercial outlets having a cargo area within a 75 m radius.	▼						
N. of daily operations	▼						
N. of deliveries						▼	
Type of goods delivered						▼	
Occupancy status of load and unloading parking spots						▼	
Constraints identified during the last mile stage						▼	
Number of cargo vehicles entering from outside the city borders					▼		
Overall transited cargo in the city split by transport mode (road, rail, air, water)					▼		
	Infrastructures/Vehicles						
Number of EV charging points in micro platforms	●						
Number of logistic centres	●	●					
Percentage of alternative fuel vehicles/N. of EV		●			▼		
Number of subsidised clean vehicles	●						
N. "sustainable" commercial vehicles (cargo-bike, electric, methane, hydrogen) active in restricted traffic areas/total km^2. of ZTL-hour (n. commercial vehicles active in the ZTL compared to its extension (km^2) per unit of time).		●					
Annual fuel consumption per capita		●					
Percentage of infrastructural interventions carried out in favour of sustainable logistics.		●					

	MAD	FLO	BER[28]	PRA[29]	RIG	FUN	MECH[30]
Implementation of an overall and integrated regulatory system (goods and passengers through tariff policies for vehicle access (ZTL paid access) rewarding an eco-sustainable last mile (Yes/No)		●					
	Policy based action/Stakeholders' involvement						
Set up of a permanent forum involving stakeholders and n. of stakeholders involved		●			●		
	Data/ICT						
App users		●					
N. of ICT tools for info mobility		●					
	Environmental and economic indicators related to logistics						
Particles (PM10 and PM2.5)					●	●	
Ozone (03)						●	
Nitrogen Oxide (NO_2)	▼				●	●	
Sulfur Oxide (SO2)						●	
Carbon Dioxide (CO_2)		●				●	
Nitro Oxide (N20)						●	
Methan (CH4)						●	
Noise Level						●	
N. of employees in the logistics sector	▼						
Contribution of the logistics sector to local GDP (in percentage)	▼						

Also, the questionnaire submitted to the logistics operator encompassed a question related to the monitoring data collection. The answers are given below.

- **UPS Italy**: UPS pointed out a major obstacle to data gathering and availability since UPS works mainly with outside providers, so that an earlier agreement about data-sharing with external partners is necessary. Internal system can provide following information by zip code:
  - Number of packages
  - Number of stops
  - Kilos and volume distributed.
- **DHL Spain**: Operations-related data is collected through the Transport Management System.

Table 18 Data collected by DHL (source: answer to the questionnaire)

Data	Description	Updating frequency
No. of vehicles	Number of vehicles circulating per day	Daily
Type of vehicles	Power fuel supply information of the vehicles on route	Daily
Km/day/vehicle	Km travelled per vehicle in 1 day (route)	Daily
Km/delivery order	Km travelled per delivery order	Daily
stops/route/vehicle	Number of stops per route	Daily
Time/stop	Time required in each stop to complete the required delivery	Daily
Units/stop	Number of parcels (units) delivered per stop	Daily
Average loading (units) per vehicle	Number of units loaded in 1 vehicle	Daily
Fines/year	Number of traffic fines per year for illegal loading/unloading (e.g., double lane parking)	Yearly

In addition to this, DHL has reported that e-commerce currently represents 60% of shipping and 30% of turnover for DHL Express.

Annex III. Main features of the Freight Distribution Vehicle fleet: cities answers and logistics operators answers

The transportation systems in Madrid, Florence, Berlin, Prague, Riga, Funchal and Mechelen reflect their geographical and urban characteristics. While road transportation is a common thread, each city employs specific strategies, such as water transport, eco-friendly vehicles, or advanced traffic management, to address their urban logistics needs efficiently and sustainably.

For what it concerns the road transport, Section n. 2 of the questionnaire included an optional question related to transportation modes and to the vehicle fleet main features. The answers provided from the cities of Madrid, Florence, Berlin, Riga and Funchal are reported in the following table:

City	Truck weight category	Statistics about the fuel used	Statistics about the average age	Euro categories
Madrid	Cargo vehicles	95% of commercial vehicles use diesel.	More than 10 years.	-
Florence	Light industrial vehicles.	92.9% of the vehicles use petrol or diesel fuel; only 1% of the vehicles use alternative fuel.	17% of the vehicles were registered before 2003	34% belongs to the Euro 0 – Euro 4 range.
	Heavy industrial vehicles	98.9% of vehicles are powered by petrol or diesel	-	57.8% belongs to the Euro 0 – Euro 4 range.
Berlin	Trucks and tractors	92.9% of trucks and tractors use diesel and the 5,5% use gasoline.	-	-
	Commercial vehicles of up to 0.9 t	2,2% of commercial vehicles are electric or powered by CNG or LNG.	-	-
Riga	Cargo vehicles	Total number of logistics vehicles: 33.432 vehicles • 95.4% - diesel • 3% - gasoline • 1.1% - LPG • 0.4% - natural gas • 0.1% - electric powered	-	-
Funchal		Majority is still powered by fossil fuels (no statistics available)	-	-

The same information was also asked to the UNCHAIN logistics operators. Their answers are reported below:

Funded by the European Union

- **Vehicles in use fleet**:
    - **DHL Spain**
        - Trucks: DHL employs various types of trucks, including large delivery trucks, box trucks, and semi-trailers. These trucks are commonly used for long-distance transportation, intercity routes, and deliveries to remote areas.
        - Vans: used for both urban and suburban deliveries, suitable for navigating narrow streets and congested city centers. Vans provide flexibility for delivering packages and parcels within shorter distances, including last-mile deliveries.
        - Cargo Bikes: DHL employs cargo bikes in urban areas, especially in densely populated cities or city centers with pedestrian zones. They are equipped with storage compartments or trailers to transport small to medium-sized packages.
        - Electric Vehicles: Electric vehicles include electric vans and trucks, as well as electric cargo bikes. between September and October 2023 DHL Express will incorporate 40 new electric vans to their fleet and it is expected to increase that number up to 120 over the next 2 years. DHL Express may also utilize hybrid vehicles.)
        - Motorcycles: Motorcycles are used for quick and agile deliveries, especially in congested urban areas where parking and maneuverability can be challenging.
    - **UPS Italy**
        - Trucks / trailer are used for linehauls
        - Vans are used for distribution. Occasionally big vans or small trucks are used for big deliveries.
        - Cargo bikes: are used for shot distance deliveries.
        - EVs and alternative fuels-powered vehicles: In Italy ownership of the vehicle is of the provider of service working for UPS, therefore this one is the responsible for each of them. Vehicles and fleet therefore vary from a facility to others.
- **Environmentally friendly procedures and features**:
    - **DHL Spain**
        - Route Optimization: DHL employs advanced route optimization software and technologies to minimize the distance travelled and improve fuel efficiency.
        - Packaging Optimization: DHL Express encourages its customers to optimize packaging materials to reduce waste and minimize the volume and weight of shipments.
        - Carbon-Neutral Services: DHL offers carbon-neutral shipping options to its customers. This means that the carbon emissions generated during the transportation of packages are offset through investments in verified

climate protection projects. This initiative helps to neutralize the environmental impact of the transportation process.

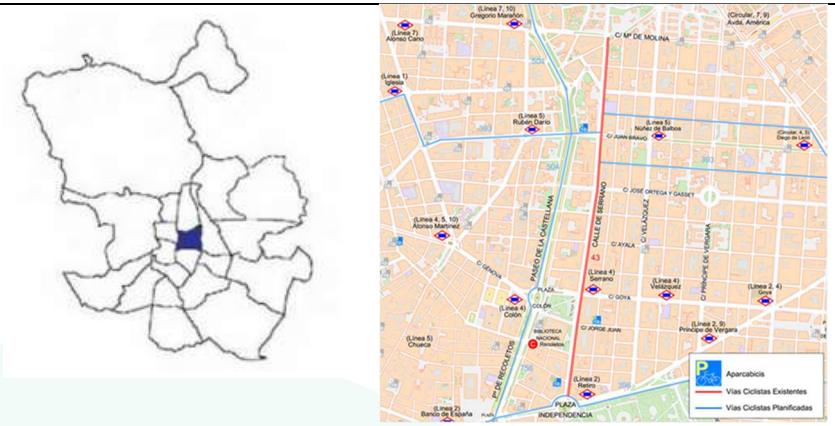
- **UPS Italy**
  - UPS logistics includes a set of procedures and features as well as proprietary technologies that are used to be more efficient and sustainable.

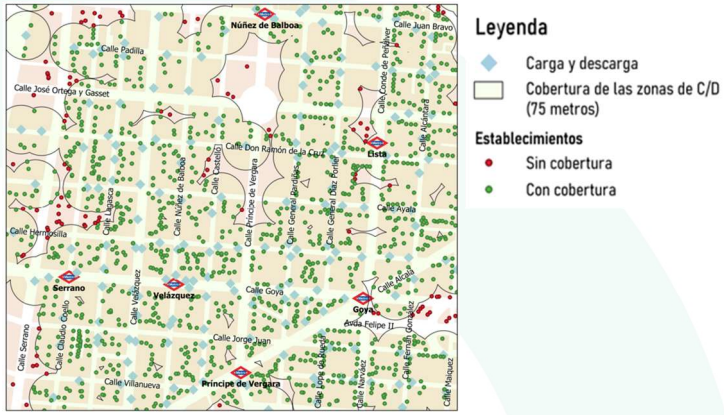
Annex IV. Demo sites identification: some first results

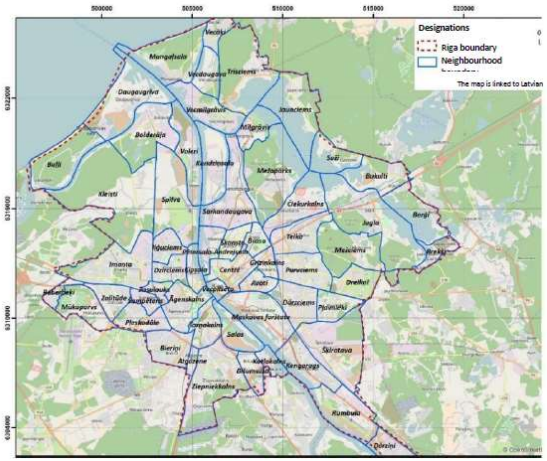
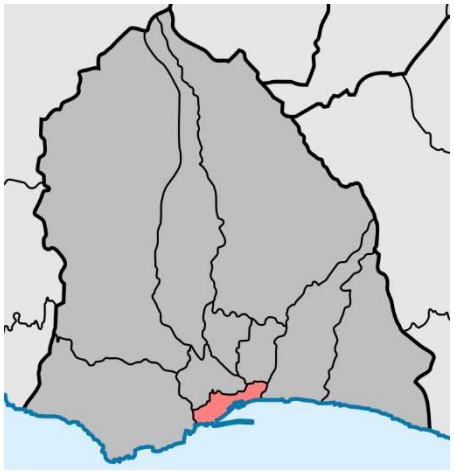
The UNCHAIN project products, that will be developed within Working Packages n. 3, 4 and 5, will be tested (WP6) in the 3 project living labs (MAD, FLO, BERL) and the 4 follower cities (PRA, RIG, FUN, MECH) based on the requirements and use cases (UCs) identified in WP2.

The Co-Creation of UCs is currently ongoing (October 2023) but, as mentioned in the previous paragraph 2 “Methodology” of the deliverable, the questionnaire addressed to the cities also included a section aimed to collect some very first information about the Demo Sites, when already identified.
Cities of Madrid, Florence, Prague, Riga and Funchal has provided some first details about what will probably officially defined as demonstration sites for the use cases.
It is therefore specified that the information reported below may be revised accordingly to the area identified as the final choice for testing the project tools.

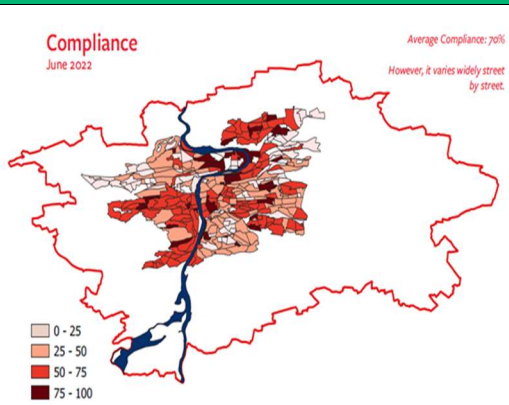
Funded by the European Union

	MADRID	FLORENCE
Demo site	**Serrano Street/ Salamanca district (Use case 2)**	**Historical centre district markets (San Lorenzo and Sant'ambrogio)**
Location	City Centre	Historical centre
Map of the site	 *Figure 35 The Salamanca district and the Serrano street (Ayuntamiento de Madrid)*	 *Figure 36 The city area where the markets are located (Comune di Firenze)*
Socio-demographic context	• The Salamanca district has 145.457 inhabitants (4,4% of Madrid's population). Population density is of 270 inhabitants/ha. (which is above the average for Madrid, 54,5 inhab. /ha) • More than 60% of the population of the Salamanca district reaches higher education (university or similar), only 5% of the population has insufficient education (higher percentage of people with higher education than the city average).	• The area including the historic centre has 73.916 inhabitans(19% of Madrid's population). Population density is of 9.000 inhabitants/km^2. (which is above the average for Florence). • This part of the city is mainly characterised by the urban settlement system of the historic centre of Florence, declared "World Heritage Site" by UNESCO.
Economic-context	• Gross income per capita: 35.091,00€ (17.059 €/pc at city level) • Economic activity: almost 40% of the currently open business premises are dedicated to retail activities and almost another 20% are dedicated to lodging and food & beverage	• Hight commercial activities density (HoReCa, commerce and offices). • Commercial activities: 7 district markets, 103 medium retail structures and 3 large retail structures.
Land use and infrastr.	• Residential area: 3.342.611 m2 (62% of the district surface) • Leisure area: 361.668 m2 (7% of the district surface) • Industrial and commercial area: 527.376 m2 (10% of the district surface)	• Pedestrian area: 234.796 m^2 • Bicycle paths length: 14 km^2 • Leisure area: 545.194 m^2

	MADRID	FLORENCE
		• To the central nucleus are added the functional system of the Santa Maria Novella station and the congress and exhibition centre of the Fortezza, the Oltrarno, the historical villages of the Aconella and the Pignone. • The whole area of the historic center of Florence is defined as limited traffic area.
Main issues identified	• The urban density of the district is much higher than the urban average. • The agglomeration of productive uses and the scarcity of land providing free spaces and green areas give rise to congestion problems with the consequent negative repercussions on the mobility and environmental quality of the district. • There are environmental problems of congestion, atmospheric and acoustic pollution, because of the excessive concentration of activities and jobs. • According to the Psychosocial Study of the Impact of Noise, 70% of the population is affected by the external impact.  *Figure 37 Coverage of commercial outlets by loading and unloading areas*	• Traffic congestion. • Air pollution. • Waiting time. • Urban maintenance (pavement, street furniture).   *Figure 38 Sant'Ambrogio and San Lorenzo Market, Florence*

	PRAGUE	RIGA	FUNCHAL
Demo site	**Prague 5 District**	**RVC-AZ**	**Sé parish**
Location	West side of the Vltava river	Historical centre	Historical centre
Map of the site	 *Figure 39 Prague 5 district (Municipality of Prague)*	 *Figure 40 Riga's neighbourhoods (source Riga SUMP)*	 *Figure 41 Sé Parish in Funchal (source Wikipedia)*
Socio-demographic context	• Number of residents: 85.687 (6.7% of Prague's population); • Population is increasing and is expected to reach 118.989 by 2050; • 3.150 residents per km² (which is above average for Prague, which is 2.570 residents per km²); • Population with high school diploma (33.55%) and university degree (44.1).	• Number of residents: 50.000-60.000 (10% of the entire Riga's population); • Population is decreasing; • Density reaches 7.963 people/km² (average population density in Riga – 2.409 inhab./km²).	• N. of inhabitants 2.875 (+8,51%, in comparison to the 2011 Census). 2,7% of the city's population; • Level of education: around 30% of the population wit Superior education (Higher percentage of people with higher education than the city average, that is around 20%).
Economic-context	• No specific data for per capita GDP. Nevertheless, generally, incomes in Prague are not greatly differentiated according to the municipal district;	The Area has multiple schools, most municipal offices, university faculties, 2 big shopping malls and many smaller shopping centers, local small scale businesses (restaurants, cafes, shops,	Most of employees in the area work in the accommodation sector, in the public administration, and in the health sector.

	PRAGUE	RIGA	FUNCHAL
	• There are 46.520 shops, services, offices and other economic facilities in the neighborhood; There are 2 shopping malls and 13 grocery stores.	kiosks etc.) Riga Central Market (one of the main tourist attractions), UNESCO protected historical center (one of the main tourist attraction), many state, municipal and privately owned museums.	
Land use and infrastr.	The neighbourhood is 27.511.000 square meters (that is 5.54% of the city) • Residential area 10.416.180 square meters and 38% over total surface; • Commercial and industrial: 3.301.320 square meters and 12% over total surface; • Leisure area: recreational 7.145.860 square meters and 26% over total surface, parks and greenery: 825.330 square meters and 3% over total surface; • Unknown: 5.777.310 square meters and 21% over total surface. There are 255, 83 KM of streets in Prague 5 and 2 KM of bike lanes. In Prague 5 a freeway runs on the outer edge of the neighbourhood and vehicles above 6 tons are not allowed. There is a railway station in Prague 5 that, in the past played a significant role in urban logistics. It has a strategic location because of its immediate connection to the city's freeway system that circles around the city, making it easy to load and unload goods between the railway to highway transport. There is a micro hub for cargo bikes with 8 operators.	• Overall area: 19.7 km^2 • Pure residential area takes up 1.13 km^2 (5.7%) • Mixed use (residential + commercial) areas take up 7.45 km^2 (37.8%) • Public use territories take up 1.56 km2 (7.9%) • Street, roads and motorways take up 3.86 km^2 (19.6%) • Parks take up 0.25 km^2 (1.3%) • Other green territories take up 1.45 km^2 (7.3%) • Water takes up 3.60 km^2 (18.2%) • Tehnical use territories take up 0.39 km^2 (2.0%)	• Total Area: 3,83 km^2 • Central: 2,45 km^2 • Special infrastructure (port): 0,15 km^2 • Residential: 0,17 km^2 • Green spaces: 0,11 km^2 • Buildings exclusively residential: 89% • buldings mainly residential: 10,4% • Buldings mainly not residential: 0,6%
Main issues identified	• Low average compliance with the parking rules; • Few parkings for L/U operations: total of 19,623 parking spots, with 14.887 allocated for residential parking permits within this district. Specifically, within the targeted area of Prague 5 for the pilot initiative, there are an estimated 1.500 to 6.000 residential parking spots, ¾ of the total.	• UNESCO Habitat protection area regulations applied; • Motorway of state level (Brīvības iela) importance crosses the area of RVC AZ; • TEN-T road network crosses RVC AZ; • Currently, a several key nodes and intersections are under maitenance, which causes a lot of traffic jams;	• New functional and touristic centers are not articulated, with issues related to mobility and public space management; • Inadequate conditions related to pedestrian accessibility outside city core, due to heightened slopes; • Illegal parking in dedicated parking spots, sidewalks and road lanes;

	PRAGUE	RIGA	FUNCHAL
	 *Figure 42 Compliance rate in Prague 5*	• Public transport lanes frequently overlap with regular vehicle lanes, which causes public transport to be affected by traffic jams; • No urban logistics hubs; • Lack of statistical overview for the area (demographics, economic activity, number of businesses etc.). No singular data base has been made specifically for RVC AZ yet; • No active sensors for traffic counting, few surveilance cameras are equipped with the necessary software; • No joint organization for deliveries in the RVC AZ área.	• Lack of regulation related to freight logistics; • Lack of freight hubs (central and peripheral); • Lack of availability of data related to freight logistics.

Annex V. European Best Practices Database

A database of best practices from European projects has been developed and shared in the project common repository to be continuously updated.
The first section is dedicated to Civitas projects, extracted from Civitas database. CIVITAS is a program of the European Union dedicated to promoting sustainable urban mobility in cities across the continent. Since 2002, sustainable mobility measures have been tested in CIVITAS cities as part of Living Lab projects.
In the context of urban freight logistics CIVITAS has developed a valuable best practices database. This database represents a crucial resource for European cities seeking to improve the management of urban logistics. It gathers a wide range of exemplary practices, innovative solutions, and effective strategies implemented in various EU cities to address challenges such as traffic congestion, air and noise pollution, and inefficiencies in urban freight transport operations. The collected best practices span from promoting the use of zero-emission electric or hydrogen vehicles to implementing low-emission zones, optimizing delivery routes, and fostering collaboration among key stakeholders such as logistics operators, businesses, and local authorities.
This database is a crucial tool to enable European cities to learn from one another, adapt solutions to their local specificities, and progress toward more efficient and eco-friendly urban freight logistics.

The second section of the European BP database consists in a collection of all other projects from different programs (Horizon, Interreg, National programs, and so on).
The information has been gathered from EU portals and partners direct know-how and experience.

The Best practices database is available for the project consortium in the project common repository. For illustrative purposes, a screenshot of the first section of the EU BP database is hereafter attached.

Funded by the European Union

Name of the best practices	Summary	City	Started	Project	Link
Freight distribution Hub	Due to its relatively peripheral location in relation to UK distribution centresm, Scottish Central Belt regional distribution centres, UK distribution centres, and other key import/export gateways, the economy of Aberdeen is highly dependent upon efficient and effective logistics.	Aberdeen	April 2017	PORTIS	https://civitas.eu/mobility-solutions/freight-distribution-hub
SMART Transport Systems for Freight	Aberdeen City Council has deployed heavy goods vehicle (HG)V priority measures along Wellington Road, a main HGV route to the south of the city. Sections of this corridor are located on a steep gradient. In order to prevent HGVs having to stop and start at junctions located on the steeper sections of this corridor, measures were deployed to extend the signal timings if a HGV was detected.	Aberdeen	April 2017	PORTIS	https://civitas.eu/mobility-solutions/smart-transport-systems-for-fre
Freight Gateway Inter-connectivity	City ports have the interesting situation of handling various freight types. This includes 'normal' city freight (for both consumer distribution and 'industrial production), which needs to be monitored, controlled, and handled in a way that reduces environmental impact.	Aberdeen	April 2017	PORTIS	https://civitas.eu/mobility-solutions/freight-gateway-inter-connectiv
D4 Service: The Smart Distribution System	The Sustainable Urban logistics Plan (SULP) of Las Palmas de Gran Canaria (measure LPA 5.2 of the CIVITAS DESTINATIONS project) identified the strengths and weaknesses of urban freight in the city. Amongst the weaknesses, the SULP spotted the following: poor degree of digitisation of the local freight companies and a lack of information about last mile deliveries. The D4service is a smart distribution system offers the possibility to make urban delivery processes more efficient. It is a mobile App that organizes delivery routes automatically and allows real time communication with customers. The introduction of this system in Las Palmas de Gran Canaria is in line with the overall urban freight strategy defined in the SULP that is being developed in a parallel.	Las Palmas de Gran Canar	March 2017	DESTINATIONS	https://civitas.eu/mobility-solutions/d4-service-the-smart-distributio
Urban Freight Solutions into SUMP	Although Las Palmas de Gran Canaria has already developed a SUMP (2009-2012), there is a need to analyse urban freight solutions in the city. Thanks to CIVITAS DESTINATIONS, a Sustainable Urban Logistics Plan (SULP) is being developed and is to be integrated into the existing SUMP.	Las Palmas de Gran Canar	March 2017	DESTINATIONS	https://civitas.eu/mobility-solutions/urban-freight-solutions-into-sur
Sustainable Freight Logistics Plan	A Freight Logistics Plan for Rethymno is under development, which aims to optimise goods delivery routes and reduce environmental and social impacts in the city. Logistics stakeholders are actively involved in the conception of plan.	Rethymno	March 2017	DESTINATIONS	https://civitas.eu/mobility-solutions/sustainable-freight-logistics-plar
Sustainable Elba Logistics Plan	Elba Island is characterised by high levels of vehicular traffic, made up of both commercial and private vehicles, especially during the peak tourist season. This measure aimed to improve the quality of the residents' and tourists' life as well as the environmental conditions, by developing a Sustainable Urban Logistics Plan - a policy framework for sustainable freight transport on the island.	Elba	March 2017	DESTINATIONS	https://civitas.eu/mobility-solutions/sustainable-elba-logistics-plan
Mapping freight traffic flows and designing a distribution plan	This measure will first analyse existing conditions by mapping supply chains for the Constanta metropolitan area, allowing for the re-evaluation of the position of Constanta's port within these regional supply chains. The second phase will be the design of a distribution plan for the city. A detailed analysis of the supply lines serving commercial hotspots, restaurants, and other institutions will be done, and will include timing, access, the duration of the deployment, and risks and vulnerabilities from the blocking of traffic. A plan for freight distribution in the central area of the city will be drafted based on these analyses. In turn, this will be presented to the city for approval and implementation.	Constanta	January 2017	PORTIS	https://civitas.eu/mobility-solutions/mapping-freight-traffic-flows-ar
Improving seamless mobility through TEN-T network nodes	This measure will evaluate relevant data sources and will develop an aggregation process, analysing the gaps and the missing information. The second step will be the development of computational models to estimate the level of emissions using specialized IT platforms. In addition, an analysis of the factors that influence traffic flows on the routes connecting the TEN-T networks and the city of Constanta will be conducted.	Constanta	January 2017	PORTIS	https://civitas.eu/mobility-solutions/improving-seamless-mobility-thr
Modernising the traffic management system	As part of this measure, a study and modelling of traffic flows of heavy-duty vehicles, privately-owned cars, and public transport will be implemented in order to define the traffic management system. Implementation of the measure would integrate sustainable mobility principles into the traffic management system.	Klaipeda	January 2017	PORTIS	https://civitas.eu/mobility-solutions/modernising-the-traffic-manage
Regulating access to the port area	The City of Trieste will further develop the ICT control system that regulates access to the port to monitor how traffic from the port is distributed throughout the port and the city. This is necessary for the port-city platform, i.e. a multi-modal hub for urban, regional, national, and international movements of passengers and goods. The existing traffic checkpoints - i.e. the gates between the city and the port – will be further developed. These devices will facilitate data exchange among port terminals and the port authority, whilst also providing information on passengers and goods that enter the terminals, circulate in the areas between the port gates and the terminal gates, and enter the city.	Trieste	January 2017	PORTIS	https://civitas.eu/mobility-solutions/regulating-access-to-the-port-ar
Coordinating freight movements	The City of Trieste will introduce an efficient system of traffic data exchange and traffic control to improve the coordination of the movement of freight in and outside the port.	Trieste	January 2017	PORTIS	https://civitas.eu/mobility-solutions/coordinating-freight-movement
Coordinating freight movements	The City and the Port of Antwerp want to reduce freight road traffic in the port and city by increasing efficiency and encouraging a modal shift towards sustainable ways of freight transport, such as boats on waterways, rail, bicycle, etc. The City of Antwerp will support organisations, companies, retailers, the catering industry, and small businesses to develop sustainable logistic solutions for the transporting of their goods (Marketplace for Mobility). Furthermore, the Port of Antwerp will further evaluate different pilot projects to optimise freight transport, such as night logistics.	Antwerp	January 2017	PORTIS	https://civitas.eu/mobility-solutions/coordinating-freight-movement
Demonstration of SUMP strategies to strengthen the core to growth pole accessibil	This measure will focus on the identification of missing links and overlapping and/or contradictory measures, starting from two strategic documents: Constanta Growth Pole Sustainable Urban Mobility Plan (2014), Port Master Plan (2016)	Constanta	January 2017	PORTIS	https://civitas.eu/mobility-solutions/demonstration-of-sump-strateg
Last-mile delivery of goods	he main goal of this measure was to develop a Sustainable Urban Logistics Plan (SULP) for Valletta and develop a pilot with private operators to test out the Last Mile delivery of goods concept in Malta, using a shared electric van. The SULP for Valletta proposes that a clearer regulation of freight transport operation in urban areas is adopted at a local and national level. This should be done to protect the urban environment, to reduce air pollution, to reduce the amount of traffic infringements, and to reduce congestion on the streets and roads of Valletta, particularly during peak hours.	Valletta Region	December 2016	DESTINATIONS	https://civitas.eu/mobility-solutions/last-mile-delivery-of-goods
Limassol city centre Urban Freight Logistics Action Plan	The goal of this measure was to develop a plan for introducing innovative solutions in Limassol city centre regarding the traffic flows of freight logistics, the efficient distribution of goods, the environmental pollution and noise, hazards for pedestrians due to freight logistic services and road disturbances. The plan aimed to improve the city centre of Limassol and to change the behaviour of the relevant stakeholders and key actors.	Limassol	December 2016	DESTINATIONS	https://civitas.eu/mobility-solutions/limassol-city-centre-urban-freigl
Offering test fleet of e-bikes and cargo bikes	This measure consists in offering companies and residents in Ärsta the possibility to test E-cargo bikes for a limited period of time in order to find out whether, and to what extent, these vehicles provide a viable mobility option.	Stockholm	November 2016	ECCENTRIC	https://civitas.eu/mobility-solutions/offering-test-fleet-of-e-bikes-an
Introducing biogas for urban freight logistics	Within this measure, the City of Turku will cooperate with relevant stakeholders in order to promote the use of biogas for heavy duty freight vehicles.	Turku	November 2016	ECCENTRIC	https://civitas.eu/mobility-solutions/introducing-biogas-for-urban-fr
Sustainable city logistics by combining electric cargo bike delivery services with a fle	Traffic caused by delivery services has increased rapidly due to e-commerce. The delivery of goods by (cargo) bikes has a great potential to keep cities accessible and to improve road safety. To extend the use of cargo bikes, a flexible storage system can serve as an interface to hand cargo over from cars to cargo bikes and vice versa. Such a system will be tested by a local partner, who offers delivery by car and (cargo) bicycles alike.	Munich	November 2016	ECCENTRIC	https://civitas.eu/mobility-solutions/sustainable-city-logistics-by-con
Neighbourhood-oriented concierge system	A central concierge service for the Domagkpark area will be developed and tested during project phase. The goal is to reduce the ways of parcel delivery and pick-up in the area by the means of an integrated drop-off service for all parcel services. Consequently a central service station will be operated and complemented by the provision of other neighborhood services and aids, e.g. facility management, repairs of all kinds, sharing of tools, community and office space.	Munich	November 2016	ECCENTRIC	https://civitas.eu/mobility-solutions/neighbourhood-oriented-concie
Development of an e-bike sharing scheme	The reduction of the individual car use and the availability of multimodal mobility for everybody is a challenge for the future. Therefore the focus of this measure is on the development of a carrier e-bike for mobility-impaired people. The e-bike will be integrated in the existing bike sharing system MVG Rad and positioned on within the mobility stations at the project area.	Munich	November 2016	ECCENTRIC	https://civitas.eu/mobility-solutions/development-of-an-e-bike-shari
Prototype for an ultra-low-emission cargo vehicle	This measure aims at developing a clean cargo prototype adapted to the specific needs of Madrid's urban delivery sector. This prototype will be a 5.5 ton electric vehicle; it will be installed with a gas generator system to assist with refrigeration. The prototype will be tested under real operating conditions in order to fine-tune its design and performance, and promote the further uptake and commercialization of the improved vehicle by other stakeholders.	Madrid	November 2016	ECCENTRIC	https://civitas.eu/mobility-solutions/prototype-for-an-ultra-low-emis

Figure 43 Extract of the EU BP database developed within the UNCHAIN project

Funded by the European Union

Annex VI. Template of the questionnaire

WP2

T2.1_Diagnosis of local framework, SUMP/SULP analysis and logistics ecosystem

SPES Consulting

ANALYSING THE LOGISTICS ECOSYSTEMS AND THE REGULATORY FRAMEWORK:

QUESTIONNAIRE FOR THE CITIES

INTRODUCTION

This questionnaire is aimed at collecting the necessary data and information to get an accurate representation of the current logistic ecosystems in the seven cities involved in the Unchain project, and so identifying the possible barriers for the take up and deployment of the project measures in an optimal way. Beside this, this questionnaire is meant to analyse the legal local frameworks and the main planning document referring to the logistics and mobility.

It is made of 5 different sections:

- General information
- Description of the urban logistics system
- Regulatory framework and policies
- Links
- Data

The present document has been conceived as a "living doc" where cities can report their updated information for task and WP leaders.

The first version is due by 1st September and the analysis of the contents will be included in deliverable 2.1.

Since there are many information and data to collect, the sections about the city level are compulsory while those related to the demo sites (in yellow) could be provided later, in compliance with WP2 schedule. We strongly recommend you to start also with these sections which could support you in the clear definition of the living labs and their context.

The sections about data availability (highlighted in green) are not mandatory but could be very helpful for the definition of effective and easy-to-calculate KPIs linked with task 2.3

Requested fields
Recommended fields
Optional fields

For any info, please write to info@spesconsulting.com.

SECTION 1_GENERAL INFORMATION: Description of the local context and challenges

UNCHAIN Project partner

CITY LEVEL

Demography
Demography (n. of inhabitants, population increasing/decreasing trend, population density and population distribution)
Socio-economic context
Please provide information about the level of education, gross income per capita, data on economic activities and facilities
Territorial framework and Land use
Please provide information about the land use destination: *- residential area (squared meters and % over total surface)* *- commercial area (squared meters and % over total surface)* *- industrial area (squared meters and % over total surface)* *- leisure area (total squared meters and % over total surface)*
Challenges or obstacles
Please, provide any challenges or obstacles the system has faced, specifying the category (Please consider what was discussed at the workshop led by IBV during the KO meeting in Brussels): - *Legislation* - *Infrastructures* - *Data* - *Business models / economy.* - *Social acceptance*
Role of your city in the Functional Urban Area
Describe the boundaries of your Functional Urban Area (FUA) and the administrative role of your city in the FUA

DEMO SITE LEVEL

Demography
Demography (n. of inhabitants, population increasing/decreasing trend, population density)
Socio-economic context
Please provide information about the level of education, gross income per capita, data on economic activities and facilities
Territorial framework and Land use
Please provide information about the land use destination: *- residential area (squared meters and % over total surface)* *- commercial area (squared meters and % over total surface)* *- industrial area (squared meters and % over total surface)* *- leisure area (total squared meters and % over total surface)*

Challenges or obstacles the system has faced
Please, provide any challenges or obstacles the system has faced, specifying the category (Please consider what was discussed at the workshop led by IBV during the KO meeting in Brussels): - *Legislation* - *Infrastructures* - *Data* - *Business models / economy* - *Social acceptance*

SECTION 2_ DESCRIPTION OF THE URBAN LOGISTICS SYSTEM

CITY LEVEL

Infrastructures: City layout, logistical nodes and service infrastructures
Describe the physical infrastructure of the system and explain how the infrastructure is designed to support the movement of goods in the city (roads, ports, railways, airports, interports,…). Describe the functionality of the main warehouses and UCC (i.e., which are the main services offered besides storage, for example: inspection of incoming goods, internal logistics, stock management, order preparation, …,) where they are located, the type of warehouse (Cross-docking, Integrated Merchandise Center, Logistic Hub, …) and the role in the hierarchy of the local distribution system. Indicate any industrial/logistic area available
ICT and technology systems
Mention any innovative technologies used in the urban logistics system, such as smart traffic management systems, automated logistics centre, data (cloud, open data, platforms), parking control (access control, videocameras, apps…), IoT, WIFI / fiber coverage….)
Stakeholders
Identify the stakeholders involved in the system. Specify whether any stakeholder has certification systems in place. *Example of stakeholders:* - *demand: private consumers, retailers, HORECA…* - *offer: truckers, platforms, independent carriers, logistic public & private companies.* - *regulators: local, regional and national gov* - *service providers: parking managers, waste managers, traffic services providers, urban consolidation centres/pick up points hosts.…* *Mention any partnerships or collaborations that have been established to support the system. Explain the role of each stakeholder in the system.*

DEMO SITE LEVEL

Infrastructures: City layout, logistical nodes and service infrastructures
Describe the physical infrastructure of the system and explain how the infrastructure is designed to support the movement of goods in the city (roads, ports, railways, airports, interports,…). Describe the functionality of the main warehouses and UCC (i.e. which are the main services offered besides storage, for example inspection of incoming goods, internal logistics, stock management, order preparation, …,) where they are located, the type of warehouse (Cross-docking, Integrated

Merchandise Center, Logistic Hub, …) and the role in the hierarchy of the local distribution system. Indicate any industrial/logistic area available
ICT and technology systems
Mention any innovative technologies used in the urban logistics system, such as smart traffic management systems, automated logistics centre, data (cloud, open data, platforms), parking control (access control, videocameras, apps…), IoT, WIFI / fiber coverage….)
Stakeholders
Identify the stakeholders involved in the system. Specify whether any stakeholder has certification systems in place. *Example of stakeholders:* - *demand: private consumers, retailers, HORECA…* - *offer: truckers, platforms, independent carriers, logistic public & private companies* - *regulators: local, regional and national gov* - *service providers: parking managers, waste managers, traffic services providers, urban consolidation centres/pick up points hosts….* *Mention any partnerships or collaborations that have been established to support the system. Explain the role of each stakeholder in the system.*

Transportation Data
Describe the types of vehicles used in the system, such as trucks, vans, cargo bikes, etc.. *Mention any environmentally friendly features of the transportation, such as electric or hybrid vehicles. Please also specify how widespread e-commerce is and, if possible, indicate volumes*
Monitoring Data
What data are collected? Describe the data collection methodology and how the data is processed. *Examples (For further KPIs, please refer to section 2.1.7 of the project proposal):* · *N.good vehicle /day present in the urban area;* · *Travelled Km/day by good vehicles in urban area;* · *N. deliveries for each trip;* · *N., type, and power/fuel supply of vehicles used* · *Average loading of the goods vehicle (in %)* · *specific KPI related to implemented measures* · *Tons/Day delivered freight* · *CO2 or CO2eq emission from city logistics process (t/year)* · *How much is the logistics sector worth (€)* · *N. and distribution of freight parking spaces* · *N. and location of loading/unloading bays and demand coverage of loading/unloading bays* · *Km travelled per delivered order* · *N. of yearly traffic fines for illegal (double lane,...) loading/unloading activities* · *Air pollutant emissions (PM2.5 and NOx) from city logistic process*

SECTION 3_ ANALYSIS OF THE CURRENT LEGAL FRAMEWORK AND POLICIES

Legal Framework
List any existing national and local laws and regulations governing urban logistics. What could be the obstacles and the opportunities?

Describe current policies related to urban logistics (e.g. incentives, restrictions, limited traffic zones, Loading-Unloading, Areas, etc.). List any planning instruments adopted, specifying the year (e.g.: SUMP, SULP, SECAP, etc..)"

PLANNING DOCUMENTS

SULP (if any)

Reference year
Year of adoption and duration
Covered area
Which area does the SULP cover? · *City centre* · *FUA* · *Region/Metropolitan Area* · *…*
Urban Logistic issues
Which urban logistics related issues have been analysed for the SULP? Does the SULP clearly set out overall objectives that address the most important problems? · *Air pollution and traffic noise* · *Traffic safety* · *Traffic congestion* · *…..* *Please specify the objectives set out*
SULP scenario
Does the SULP describe current and future scenarios for the urban logistic topic? *If yes, please describe. Specify also which techniques have been used to support scenario development and appraisal*
SULP measures
Do the SULP present measures to improve the efficiency and sustainability of urban logistics and freight delivery? *Which types of measures does the SULP include?* · *Technical measures* · *Infrastructure measures* · *Policy-based measures* · *Soft measures* *Please describe the measures included*
Urban Logistic measures evaluation
After implementing a urban logistics measure, how often its success is evaluated? what are the KPIs used to evaluate the performance of urban logistics measures? *Please describe, specifying the evaluation method and the baseline measures of all KPIs used.*
Potential funding sources
Have potential funding sources for implementation of the measures in the SULP been identified? If yes, please describe.
Stakeholders engagement
Which stakeholders have been involved in the SULP development process? · *Citizens*

· *Local interest groups* · *Associations representing "vulnerable users"* · *Local business associations* · *Transport operators* · *Regional stakeholders*

SUMP (if any)

Reference year
Year of adoption and duration
Covered area
Which area does the SUMP cover? · *City centre* · *FUA* · *Region/Metropolitan Area*
Urban Logistic issues
Which urban logistics related issues have been analysed for the SUMP? Does the SUMP clearly set out overall objectives that address the most important problems? · *Air pollution and traffic noise* · *Traffic safety* · *Traffic congestion* *Please specify the objectives set out*
SUMP scenario
Does the SUMP describe current and future scenarios for the urban logistic topic? *If yes, please describe. Specify also which techniques have been used to support scenario development and appraisal*
SUMP measures
Do the SUMP present measures to improve the efficiency and sustainability of urban logistics and freight delivery? *Which types of measures does the SUMP include?* · *Technical measures* · *Infrastructure measures* · *Policy-based measures* · *Soft measures* *Please describe the measures included*
Urban Logistic measures evaluation
After implementing a urban logistics measure, how often its success is evaluated? what are the KPIs used to evaluate the performance of urban logistics measures? *Please describe, specifying the evaluation method and the baseline measures of all KPIs used.*
Potential funding sources
Have potential funding sources for implementation of the measures in the SUMP been identified? If yes, please describe.
Stakeholders engagement
Which stakeholders have been involved in the SUMP development process? · *Citizens* · *Local interest groups* · *Associations representing "vulnerable users".* · *Local business associations* · *Transport operators* · *Regional stakeholders*

SECAP (if any)

Reference year
Year of adoption, baseline emissions inventory year and target year (milestones if any)
Covered area
Which area and sectors does the SECAP cover? · *City administrative boundaries* · *City with some exceptions* · *Region/Metropolitan Area*
Objectives
Are specific targets defined in the SECAP to reduce greenhouse gas emissions, increase energy efficiency, and promote the use of renewable energy sources in urban logistics? If yes, specify
Measures
Are specific actions identified and planned to achieve these objectives? If yes, specify. *What are the KPIs used to evaluate the performance of urban logistics measures? Please, specify the baseline measures of all KPIs.*
Energy consumption
Has an analysis of energy consumption related to urban logistics been carried out in the SECAP? If yes, specify.
CO_{2eq} emission from city logistics process (TOE/year)
If possible, specify the CO2 or CO2 equivalent emissions from city logistics process (t/year)
Monitoring
With reference to the topic of urban logistics, which indicators are used for monitoring? How often does monitoring take place?

SECTION 4_ LINKS

Please, report the links to useful documents (SUMP, SULP, SECAP, regulations, analysis & studies…) or databases.

Doc name	Doc description	Link

SECTION 5_ DATA

Please, report a full list of the available data the City is willing to share with the project, and indicate their main characteristics

Data	Description	Source	Updating frequency	Data Granularity	Properties