TRANSNATIONAL REPORT ON UNDERSTANDING FREIGHT BEHAVIOURS AND IMPACTS IN SULPITER FUAS

D.T1.2.11

Version 1
19/07/2018

Index

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1. Introduction

The report concludes the work of the activities of T1.2 “Understanding freight behaviours in the Functional Urban Areas (FUAs) by on-field analysis”. This activity is the “core” part of the understanding phase of the SULPiTER project, in which the seven FUAs partners developed, tested and implemented the analytic tool of the project. The tool is functional to build solid and evidence-based knowledge of the partners' authorities to face critical issues in urban mobility planning. It is strictly linked to the other two thematic WPs that together with those “understanding” activities (WPT1) and the governance building and stakeholders engagement (WPT2) will support the seven project Partners in developing the local Sustainable Urban Logistics Plan (SULP).

The report starts with the collection of the results described by the FUAs Partners in the previous deliverables (D.T1.2.3 > D.T1.2.9). By interpretating these results, the present document indeed compares in a transnational perspective the analytic insights of the seven project FUAs: Bologna, Brescia, Budapest, Maribor, Poznan, Rijeka and Stuttgart.

DELIVERABLE	TITLE	RESPONSIBLE
D.T1.2.1	SULPiTER software Tool development for understanding freight behaviours in FUAs	01 - ITL
D.T1.2.2	Start up of SULPiTER Tool application activities & of data collection	09 - CMBO
D.T1.2.3	FUA report including SULPiTER Tool Feeding & calibration in Budapest & Vecses	02 - BP18
D.T1.2.4	FUA report including SULPiTER Tool Feeding & calibration in Maribor	03 - UM
D.T1.2.5	FUA report including SULPiTER Tool Feeding & calibration in Brescia	06 - BreMob
D.T1.2.6	FUA report including SULPiTER Tool Feeding & calibration in Poznan	08 - City of Poznan
D.T1.2.7	FUA report including SULPiTER Tool Feeding & calibration in Bologna	09 - CMBO
D.T1.2.8	FUA report including SULPiTER Tool Feeding & calibration in Stuttgart	10 - WRS
D.T1.2.9	FUA report including SULPiTER Tool Feeding & calibration in Rijeka	12 - City of Rijeka
D.T1.2.10	SULPiTER Tool application - Mid implementation meeting	01 - ITL
D.T1.2.11	Transnational report on understanding freight behaviours and impacts in SULPiTER FUAs	04 - UCV

Table 1: WPt1, structure of the task T1.2

1.1. The FUA approach of the project

The SULPiTER project designed and developed an analyitc tool for estimating the freight demand of the economic activities adopting the the Functional Urban Areas (FUA) context. OECD introduced FUAs to overcome limitations for international comparability of densely populated areas linked to administrative boundaries. FUAs are used for highly densely populated municipalities (urban cores) as well as any adjacent municipalities with high degree of economic integration with the urban cores, measured by travel-to-work flows.

SULPiTER tackles urban freight in this territorial perspective, taking into consideration the functional transport and economic relations between inner urban centres and the surrounding urban territories, as well as the functional transport and economic relations within FUAs not affecting downtowns.

1.2. The SULPiTER tool

The SULPiTER tool is to be intended as a decision support system for policy makers to facilitate the process of elaboration of alternative city logistics scenarios. The tool provides a clear understanding of the urban freight distribution in each FUA and includes a modelling system to feed the evaluation through performance indicators, in this case the Logistics Sustainability Index (LSI). The comprehensive manual for the tool implementation is included in the deliverable DT1.2.1 “SULPiTER software tool development for understanding freight behaviours and impacts in FUAs”.

The tool consists of a three-step procedure:

Figure 1: three-step procedure of the SULPiTER tool

The first step concerns the definition of the FUA and the data collection to characterize the FUA and collect all the information to represent the urban freight distribution system. The characterisation of the FUA is to be done by means of investigation (surveys, traffic counts), and gives a dimension to the demand for urban freight transport services, and to the supply (services, operators, infrastructures …). This phase is made up of four blocks of activities:

1. Identification of Supply Chains (NACE codes, economic activities);
2. Questionnaire and the survey (type of suppliers, description of establishments, warehousing spaces, vehicles, supplies, home deliveries, problems and suggestions);
3. Traffic counts (number of vehicles for different classification groups);
4. Transport operators survey (transport characteristics, origin and destination, number of stops, freight quantities …);

The second step involves specific transport models able to assess the freight demand through O/D matrices (origin/destination of freight movements), providing quantities of goods (volumes), number and type of vehicles, and giving the basis for performance analysis of the system. The transport models is made up of the following modules:

- FUA (zones, supply chain);
- Socio-economic data (inhabitants, surface, retail and warehouse employees);
- Quantity model (O-D distances, different commodities, probabilities);
- Delivery mode (transport service share and shipment size – retailer own account, wholesaler own account, third party);
- Vehicle mode (transport service –morning, afternoon; vehicle type –LGV< 1,5t, MGV1,5-3,5t);
- Matrix for the assignment (OD –vehicles/day and distances)

The third step consists of the ex-ante assessment of Urban Freight Transport scenarios and involves the calculation of the Logistics Sustainability Index to provide an aggregate performance index of the overall freight related activities present in the FUA, according to the measurements and elaborations made through the procedure of the tool. The performance measured by the LSI involves seven impact areas; economy and energy, environment, transport and mobility and society; policy and measure maturity, social acceptance and user uptake. This “step” foresees this block of activities:

- Identification and selection of stakeholders category (supply chain stakeholders, public authorities, other stakeholders);
- Selection of impact areas (economy and energy, environment, transport and mobility, society, policy, social acceptance, user uptake). Each impact area corresponds to several criteria and each criteria to several indicators;
- Assignment of weights to impact area and criterion (all values are monetized and normalized);
- Aggregation of indicators into a single LSI (weighted sum of the normalized values);
- Calculation of “BEFORE” and “AFTER” scenarios.

1.3. Report structure

Although the methodology applied is the same, the results are different due to city dimension, function, geographical position. The present report will help to classify the FUAs in a cluster, based both on the results achieved by interviews and surveys and from intrinsic parameters such as the function that every context plays in its territory. The report’s structure is made up of 4 parts:

- A comparison, divided into quantitative and qualitative aspects for the FUA features, surveys and operator interviews. For each part of the supplied methodology, a comparison table is provided, integrated, where possible, to an easy-to-read graph that provides the reader with a clear understanding of the main findings;
- A FUA “at the glance” synoptic view in form of seven “FUA Factsheet” for providing the reader with a general overview of FUA main features;
- A discussion on the problems arose during the surveys, interviews and in general from the interaction with transport operators. It was decided to describe such problems not according to their specific contents but to stress the common similarities among the FUAs case studies;

- The conclusions for summarizing the hints coming from the transnational comparison of the seven FUAs modelization in the field of the city logistics;

2. Synoptic FUAs Comparison

The purpose of this chapter is to compare the contributions provided from FUAs partners in terms of contents, to provide the reader with an easy-to-use tool for analysing and comparing the surveys carried out in the FUAs. (For detailed information, FUA reports D.T1.2.3 > 9 are available).

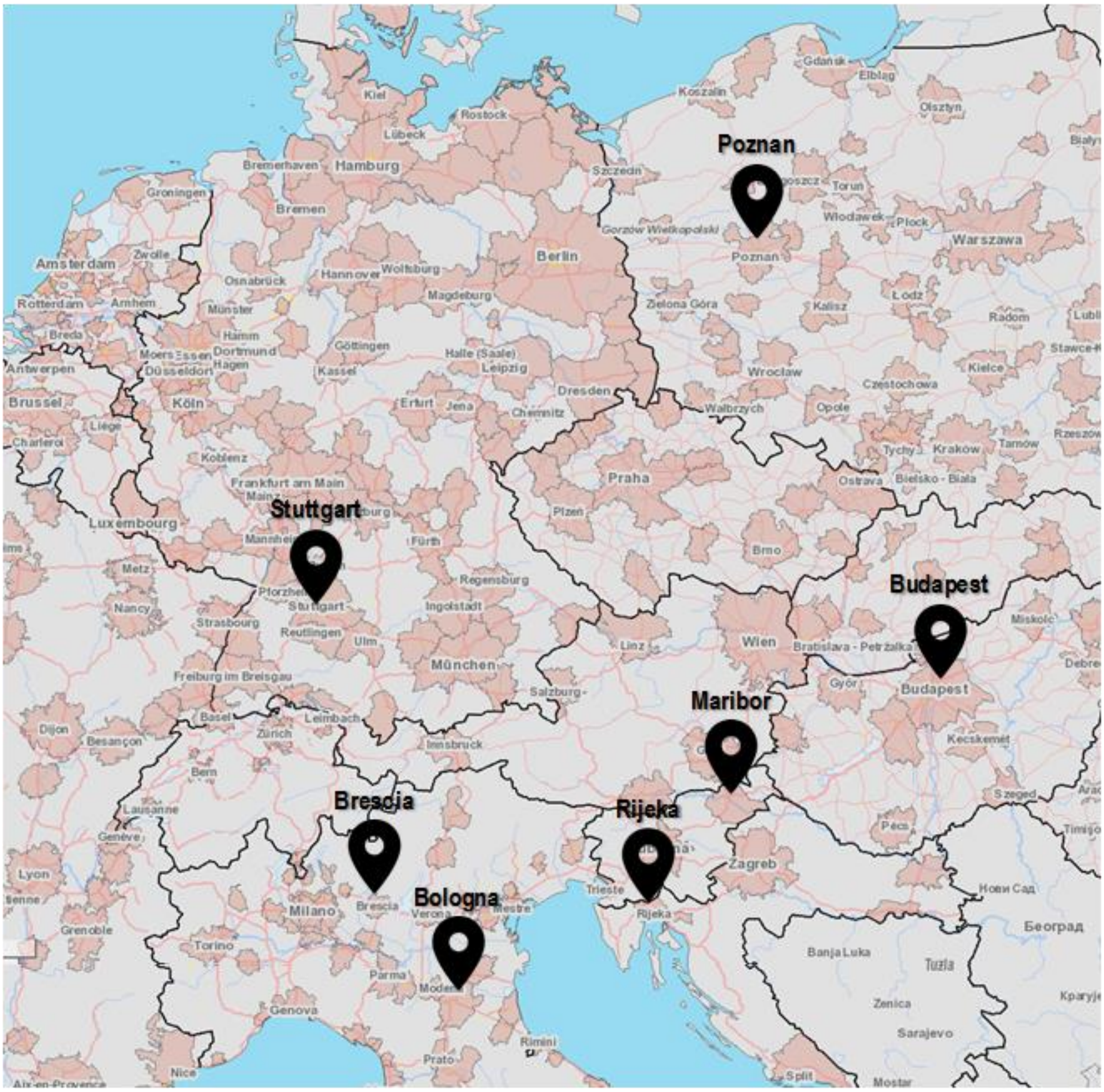


Figure 2: localization of the seven SULPiTER's FUAs

In the following figures a comparative view of the seven project FUAs, their territorial dimension and their relationship with the regional/national context is shown (maps credits: own elaboration on © OpenStreetMap contributors, EC-GISCO, © EuroGeographics for the administrative boundarie | © European Commission - DG MOVE – 2018)

01 - BOLOGNA

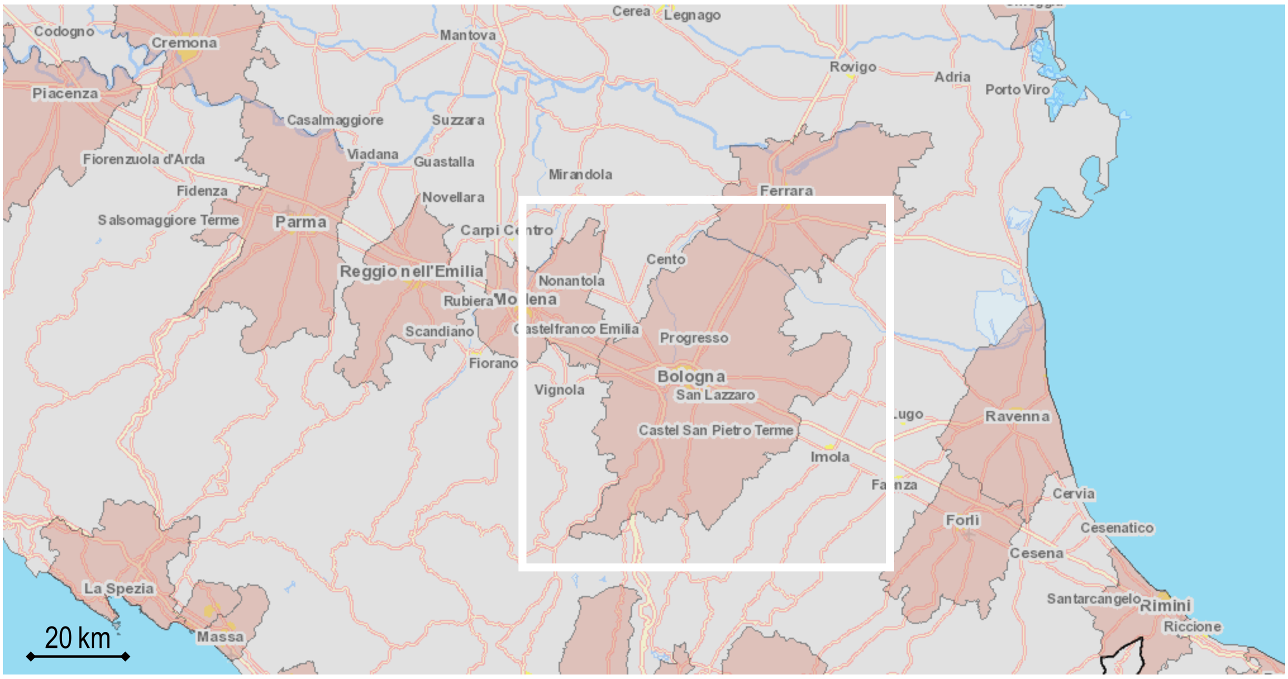


Figure 3: localization of Bologna FUA

02 - BRESCIA

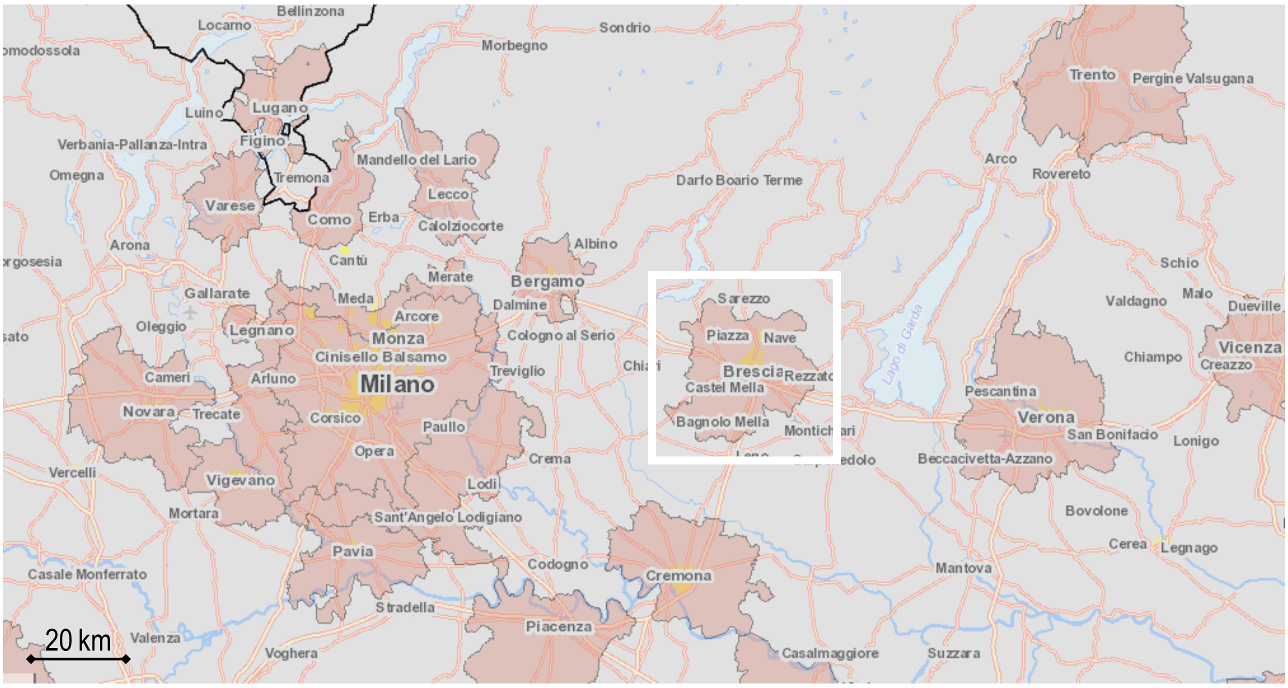


Figure 4: localization of Brescia FUA

03 - BUDAPEST

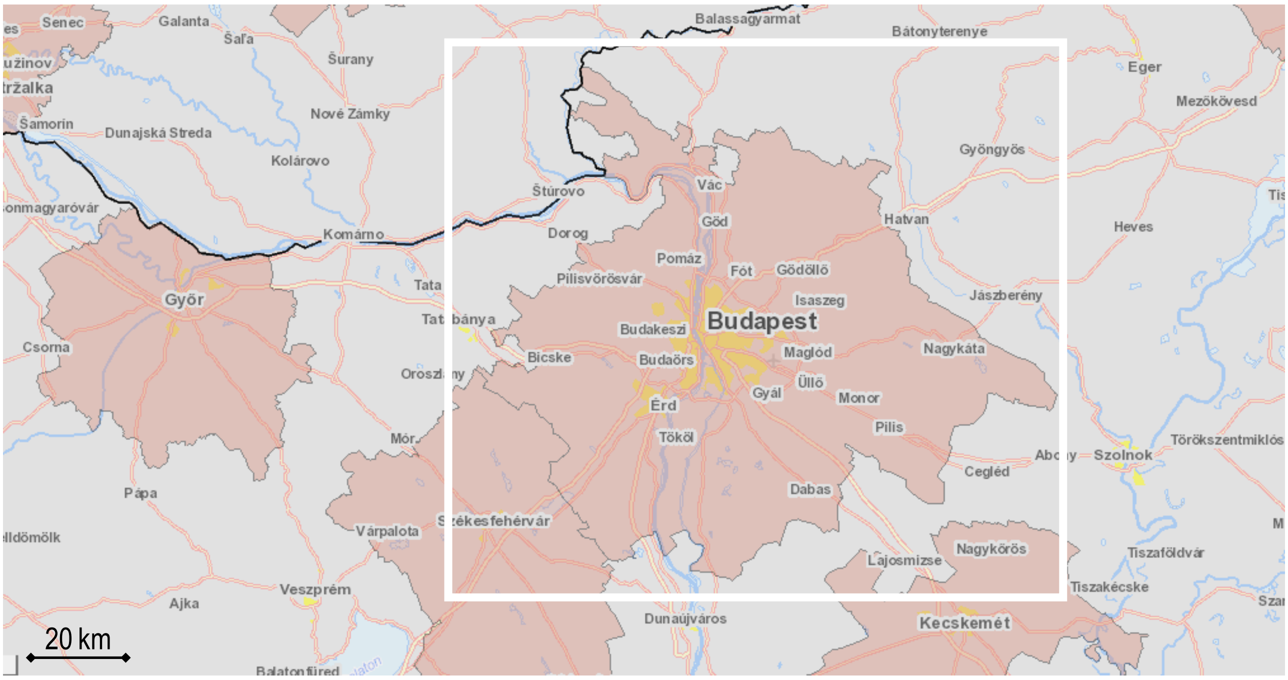


Figure 5: localization of Budapest FUA

04 - MARIBOR

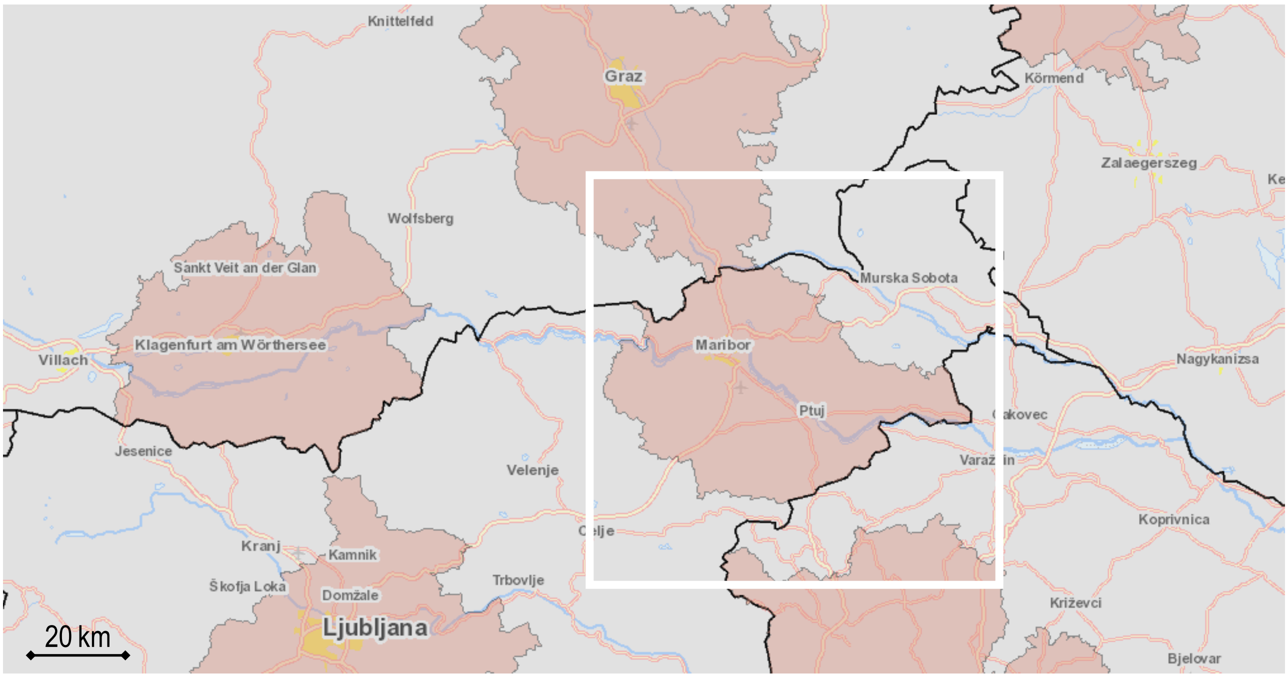


Figure 6: localization of Maribor FUA

05 - POZNAN

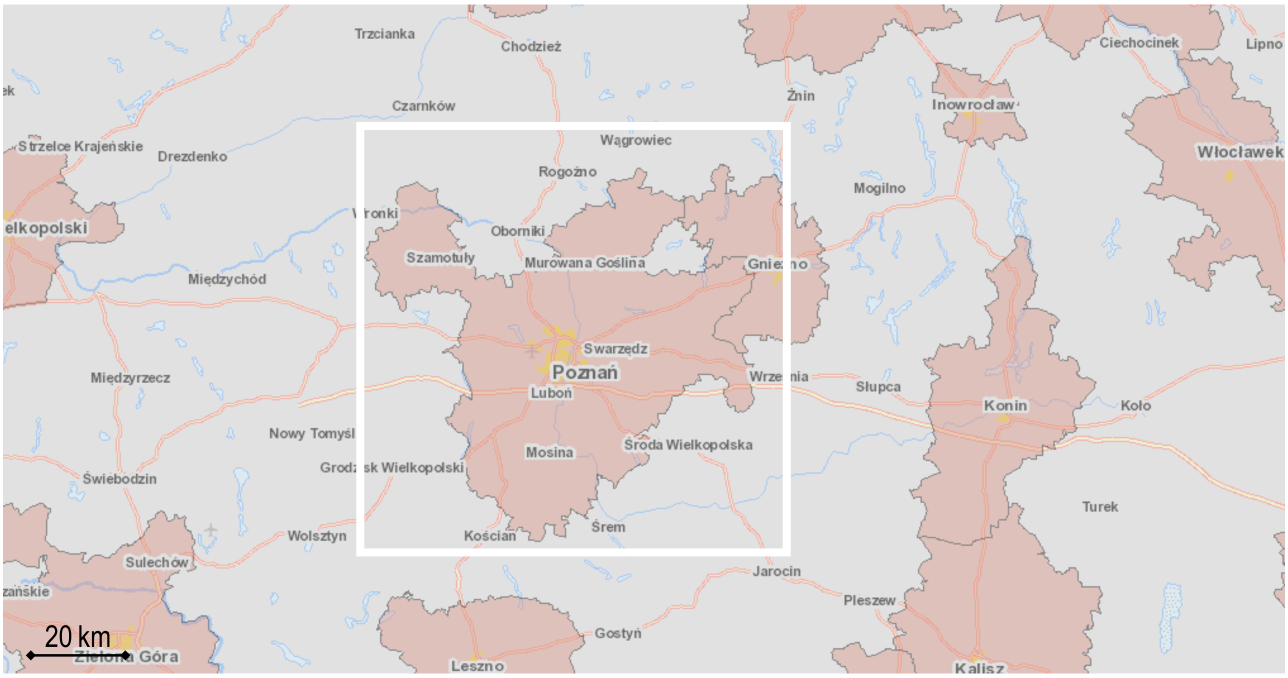


Figure 7: localization of Poznan FUA

06 - RIJEKA

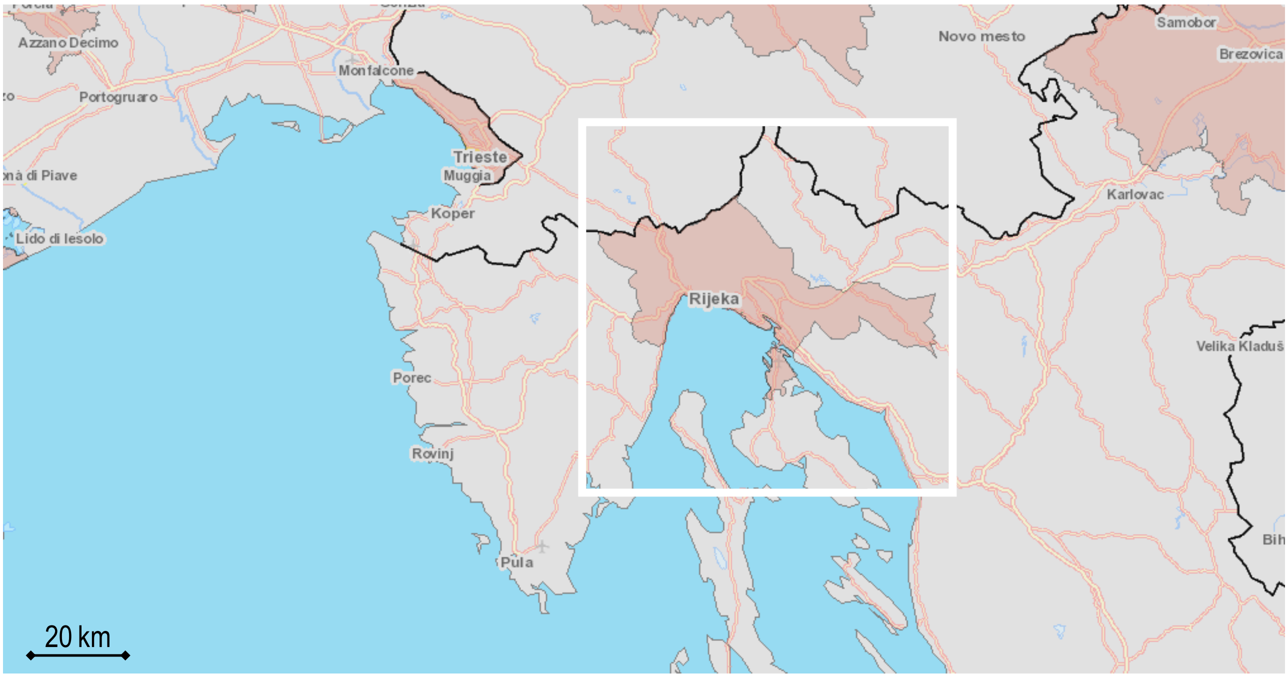


Figure 8: localization of Rijeka FUA

07 - STUTTGART

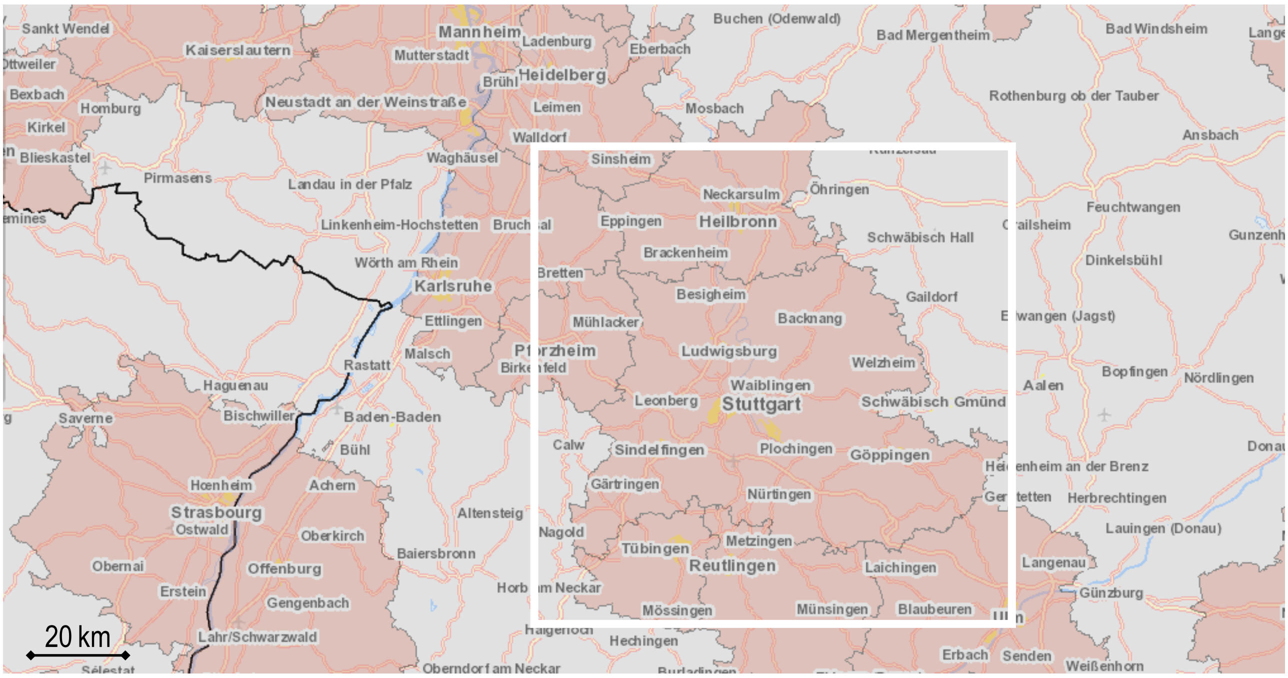


Figure 9: localization of Stuttgart FUA

Visualizing the consistency and the territorial dimension of the seven FUAs helps read the following table. The table show in a comparative way and from a quantitative point of view the socio dimension, the extension and the population density according to statistics data on FUA (OECD, 2014).

In the chapter 3" Schematic Results for each FUA - FUAs at the glance" data on FUA population is also provided by the FUA Partners but could not overlap with the following OECD FUAs' data. In soma cases, FUA Parters adopted a customization of OECD FUAs' boundaries for fitting with the needs of the territorial analsysis, considering a wider metropolitan scope.

	01 – BOLOGNA	02 – BRESCIA	03 – BUDAPEST	04 – MARIBOR	05 – POZNAN	06 – RIJEKA	07 – STUTTGART
FUA N. of inhabitants	763.811	475.187	2.879.601	246.306	950.596	202.169	1.965.942
FUA km² (Total Land area)	2.036,10	590,58	6.393,143	2.169,91	3.077,96	911,1	3.654,22
Pop density (inh/ km²)	375,13	804,61	450,42	113,51	308,84	221,90	537,99
OECD Classification	Metropolitan area	Medium-sized urban area	Large metropolitan area	Medium-sized urban area	Metropolitan area	Medium-sized urban area	Large metropolitan area

Table 2: FUAs characterization according to OECD classification (2014)

Note: OECD Classification (Small urban areas, with population between 50,000 and 200,000 - Medium-sized urban areas, with population between 200,000 and 500,000 - Metropolitan areas, with population between 500,000 and 1.5 million - Large metropolitan areas, with population above 1.5 million)

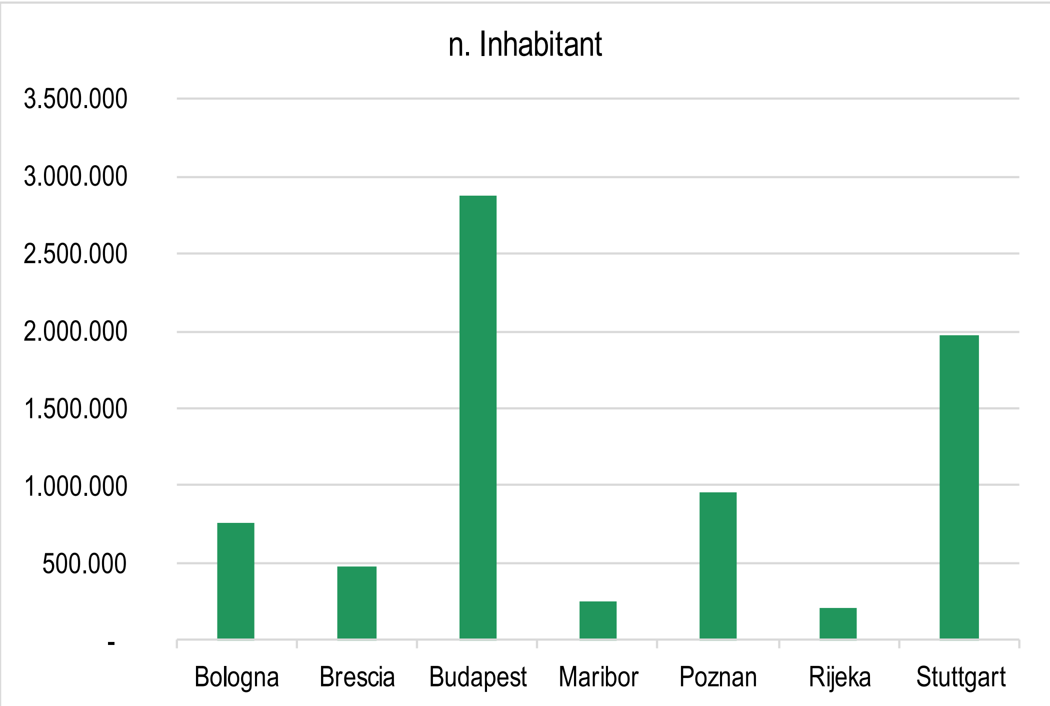


Figure 10: Number of Inhabitants per FUAs (according to OECD classification, 2014)

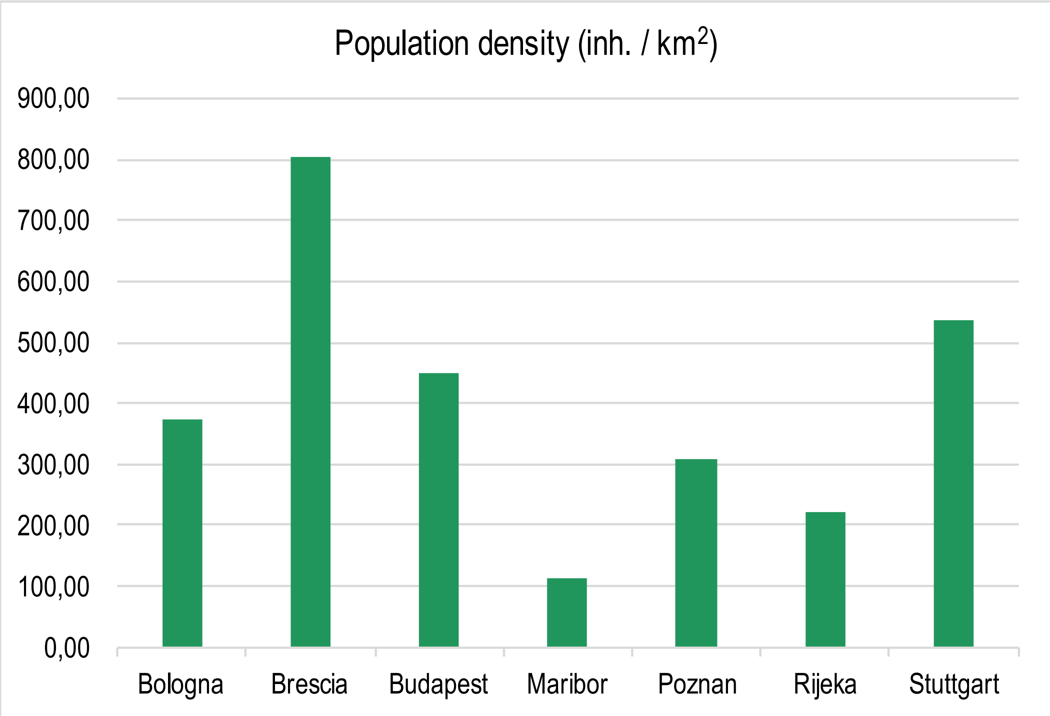


Figure 11: Population density (Inhabitants / km^2) per FUAs (according to OECD classification, 2014)

The FUAs differ a lot in terms of demographic dimension. This explains the different specific applications of the SULPiTER tool, which was used in each FUA in such a way to better adhere to the characteristics of the FUA itself.

The "customization" of approaches in defining the quantitative understanding of city logistics phenomena is further confirmed by the criteria for defining of the study areas, i.e. those portions within the FUA that were modeled. The areas vary a lot from the cases of Bologna and Stuttagart up to the Brescia and Rijeka cases.

The analysis indicates that the extension chosen for the study area is not attributable, or at least not only, to the demographic size of the FUA, but to other reasons more closely related to the characteristics of the territory, especially in relation to the functioning of the distribution of goods.

Looking to these basic features it is possible to find out some similarities for FUAs contexts that will be reflected in the impact of traffic flow. For example, it is interesting to notice that the city of Maribor is smaller for number of inhabitant but in the tool application it has considered a larger territory. This is probably related to the geographic position and the proximity with other towns, as it has a central position in a wider territory. On the contrary, Brescia for example is located between Milano and Verona and for this reason has a smaller catchment area.

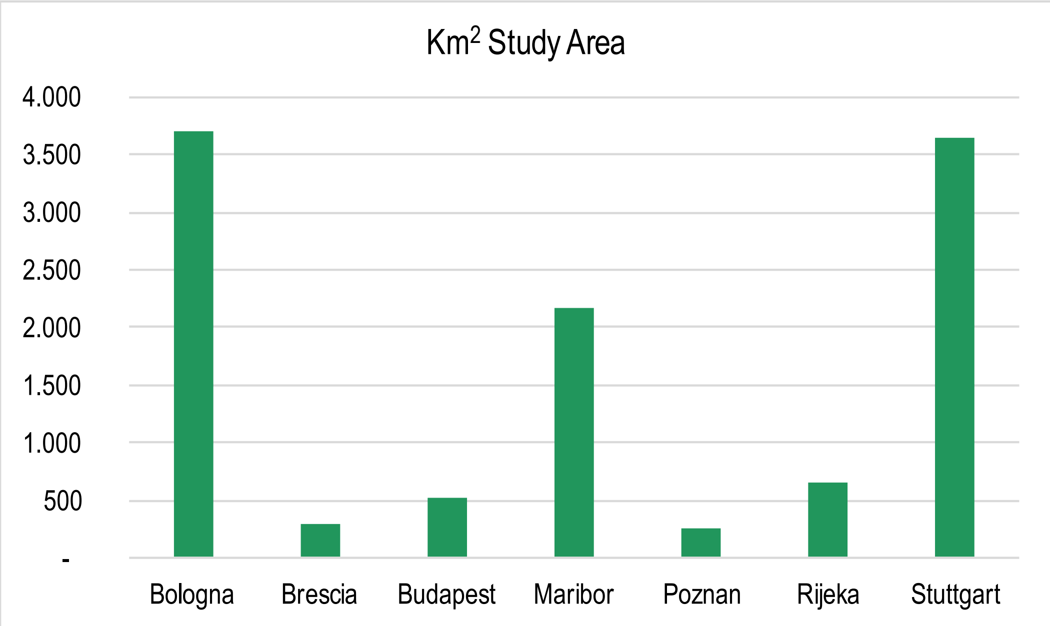


Figure 12: Km² study area per FUAs

Logistics behavior is often directly linked with the charecteristics of the urban node, in primis its own dimension and its location in relation with other urban nodes. For this reason a useful comparative assessment among the FUAs is possible through a preliminary clustering for similar territorial functions and characteristics.

For this reason, it was decided to evaluate the territorial dimension of the FUAs by understanding the role of these areas in the wider scope of the trans-european transport network. The table below then defines if and how the seven project FUAs belong to the CORE network of the European TEN-T corridors.

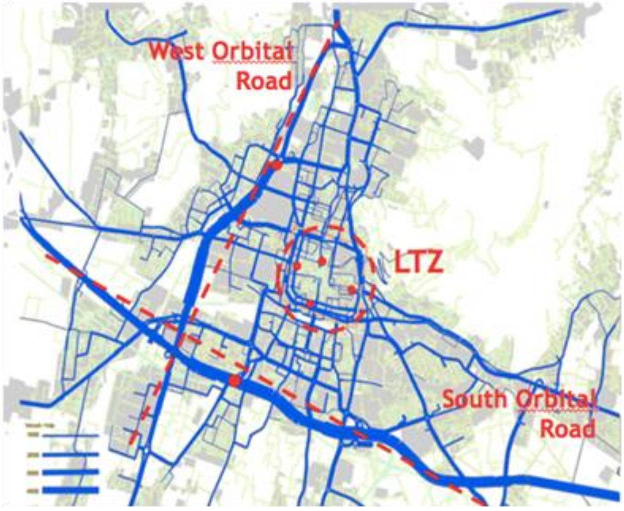
This comparative analysis allows to group three "clusters" of FUAs. The first class "a" concerns the FUAs with larger demographic dimensions (over one million inhabitants), crossed by one or more European corridors, and with "CORE" intermodal nodes. There are 4 FUAs in this cluster: Bologna, Budapest, Poznan and Stuttgart. The second class "b" concerns the FUAs of demographic size under the 400.000 inhabitants, affected by the passage of one or more European corridors but without "CORE" intermodal nodes. Two FUAs belong to this class: Brescia and Maribor. The FUA of Rijeka would have these same characteristics. However, it is a special case: it has a terminal position compared to a European corridor and has a "CORE" port node. For this reason it has characteristics to be included in a separate "c" class.

SULPiTER FUA	FUA INHABITANTS (OECD, 2014)	EU CORE NETWORK Corridor	EU CORE NETWORK Terminal (rail – road)	EU CORE NETWORK Airport	EU CORE NETWORK Port - Inland Port	SULPiTER CLUSTER
01 – BOLOGNA	763.811	▪ Scandinavian - Mediterranean ▪ Baltic - Adriatic	X	X		a
02 – BRESCIA	475.187	▪ Mediterranean				b
03 – BUDAPEST	2.879.601	▪ Mediterranean ▪ Orient/East - Med ▪ Rhine - Danube	X	X	X	a
04 – MARIBOR	246.306	▪ Mediterranean ▪ Baltic - Adriatic				b
05 – POZNAN	950.596	▪ North Sea - Baltic ▪ Baltic - Adriatic	X	X		a
06 – RIJEKA	202.169	▪ Mediterranean			X	c
07 – STUTTGART	1.965.942	▪ Rhine - Danube ▪ Rhine - Alpine	X	X	X	a

Table 3: Territorial clusterization of FUAs

This clustering, however, should refer also to the composition of the vehicular traffic affecting these areas. This aspect is particular crucial for those FUAs with a role of transit along the European corridors. For this reason, a comparative evaluation between the two FUAs of the cluster “b" allows to further evaluate this aspect, particularly relevant in terms of assessing the current state of the freight traffic. The following tables illustrate weight and importance of transit traffic in Brescia and Maribor.

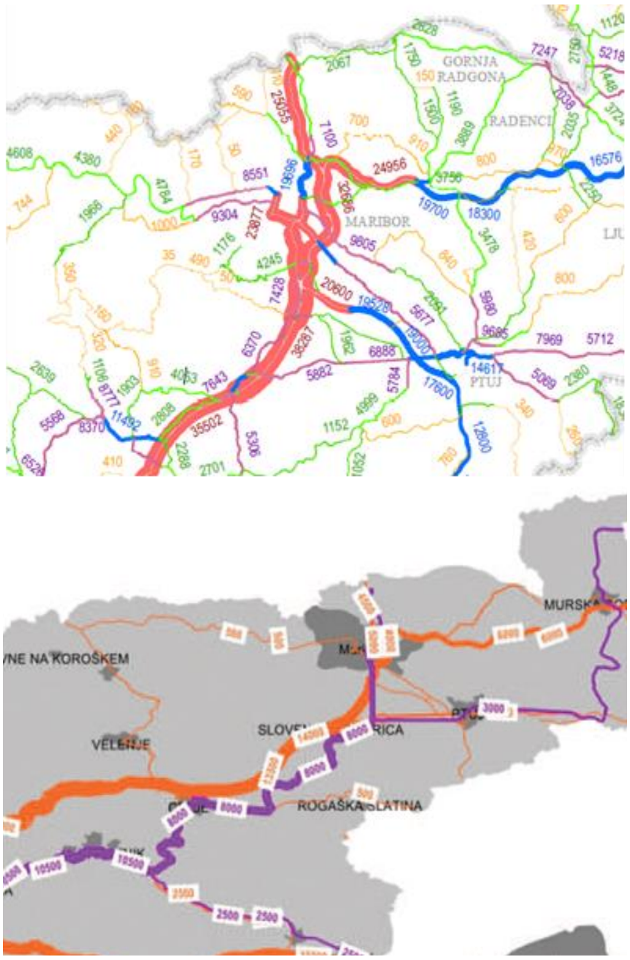
02- BRESCIA



The figure illustrates the traffic flow chart of Brescia. Seen together, the two orbital roads (the two busiest roads on the territory after the highway). form an “L” configuration: this bypass configuration, inserted in a radial pathway, ensures that freight flows in most cases pass on them.

Figure 13: Brescia FUA, traffic flows chart

04 - MARIBOR



The Figure shows the AADT on roads in Maribor FUA (on left side – Source: Slovenian infrastructure agency) and freight flows (in 1000 tons/year) for road and rail (orange and purple) on sections transiting Maribor FUA (on right side - Source: Transport Development Strategy of the Republic of Slovenia Until 2030).

As can be seen from the figure, substantial share of traffic is transiting (bypassing) Maribor FUA, especially in direction “Ljubljana – Austria”. This is valid for general traffic (left side of the figure) as well as for freight traffic flows (right side of the figure). At the same time a bit bigger share of freight flows is evident in direction to Murska Sobota (and further on to Hungary) in comparison with direction to Ptuj (and further on to Croatia).

Figure 14: Maribor FUA, traffic flows chart (AADT and freight flows)

Moving to a cross-evaluation of city logistics issues, it is interesting to compare the ex-ante self-assesment of the FUAs' main issues, which were declared at the beginning of the project by the FUAs Partners (see the table below). This should be considered as the starting point of the FUAs before the project's activities; it is a general description of city logistics' problems, both infrastructural and regulatory. It is interesting to note that for some of them, the lack of data on the current state of the urban freght distribution is perceived among the most urgent issues to be tackled. This fact increases the relevance of the SULPiTER tool for filling in this gap.

SULPiTER FUA	MAIN PROBLEMS / CHALLENGES OF THE URBAN FREIGHT DISTRIBUTION (ex-ante self-evaluation, July 2016)
01 - BOLOGNA	▪ Freight transport logistics is a very significant problem for Bologna both for the high level of congestion of the road system and for the high movement of goods affecting the area of Bologna; ▪ The high amount of goods is partly in origin and destination, and partly in transit due to the central position of Bologna; ▪ The area dedicated to logistics have been greatly expanded and have spreaded in the past, often in uncontrolled manner; ▪ There is a strong component of small and very small lorries ▪ Lack of coordination and uniform policies
02 – BRESCIA	▪ Lack of green vehicles; ▪ Cultural resistance to change; ▪ Unauthorized access to the Limited Traffic Areas distributed in the city center.
03 – BUDAPEST	▪ Different needs of residential and business areas in the territory; ▪ Conflict with the inhabitants due to noise/CO_2 emission; ▪ Crossing traffic between the city and agglomeration; ▪ Unpredictability – absence for a long-term urban environmental planning.
04 – MARIBOR	▪ Collaboration (fragmentation of deliveries, many small delivery companies/own account transport, no consolidation); ▪ Number and position of loading bays (problem of double parking, safety and congestion issues); ▪ Cessation of commercial activities in city centre (trend of large commercial centres outside of old city centre but still in the city and also because of the problem of accessibility to city centre); ▪ No information on companies' needs.
05 - POZNAN	▪ Lack of defined policy tools dedicated to urban freight transport; ▪ Lack of real and detailed information for the city stakeholders about Freight transport in general for the optimisation purpose; ▪ Lack of distribution centre dedicated to small retailers and HoReCa; ▪ Ineffective enforcement of existing traffic regulations; ▪ Great amount of lorries entering the city centre in the same time interval, extending transshipment time, no dedicated space for loading and unloading operations.
06 – RIJEKA	▪ Planning urban freight distribution system in the whole FUA area (for now separate for every municipality) ▪ Harmonizing port traffic with the urban freight distribution activities in the city centre ▪ Encouraging eco-friendly vehicles;

	▪ Reducing traffic congestion by introducing enhancend rules on delivery; ▪ Reducing CO_2 emissions due to the better balancing of traffic flow (IT tools).
07 – STUTTGART	▪ Intense goods traffic between the industrial areas, along the supply chain; ▪ Land use restrictions and land prices result in logistics hubs too far off the center, causing traffic; ▪ Road congestion, because the area has very few main roads as result of hilly topography; ▪ Record levels of fine-particle pollution, due to topography and micro climate, turning "freight" purely into a traffic issue; ▪ Municipalities are small compared to the region as a whole, so they have little to win and much to lose on any large-scale solution; ▪ Urban freight viewed mainly as a downtown store delivery issue results in misdirected policies of little relevance.

Table 4: The main problems / challanges of the urban freight distribution of FUAs partners (ex-ante self-evaluation, july 2016)

Regarding the application of the SULPiTER tool methodology, all FUAs carried out both surveys on distribution flows and on transport operators, using similar surveys schemes but focusing on specific aspects for each FUA. In line with the project approach, a common methodology was applied in each case study while the different contexts lead to specific applications to cover the specific needs of each FUA.

Leaving aside quantitative comparison of the data, the following table shows the content of the deliverables according to the way that FUAs Partners have processed and presented the data. This kind of comparison allows understanding the customization of the common methodology for applying the SULPiTER tool in each FUA, and the different approaches in conducting the surveys or reporting the results.

	01 - BOLOGNA	02 - BRESCIA	03- BUDAPEST	04- MARIBOR	05- POZNAN	06 - RIJEKA	07 - STUTTGART
TOOL METHODOLOGY							
N. of zones used in the tool and in the o/d matrix	X	X	X	X	X	X	X
Zoning criteria	X	X	X	X	X	X	X
Zoning map	X	X	X	X	X	X	X
SURVEY ON DISTRIBUTION FLOWS							
Total number of interviews (per supply chain)	X	X	X	X	X	X	X
Distribution of interview for activities	X	X	X	X	X	X	X
Distribution of trucks per fuel type			X	X			
Commercial entities per ground surface				X	X		X
Number of suppliers (average per category …)		X		X	X		X
Share of DDP, EX-WORK and OFF TRUCK delivery modes	X	X	X	X	X	X	X
Dimension of load Unit	X	X	X				
Dimension of packages				X			
Weight of packages				X	X		
Frequency of deliveries and type of load units	X			X	X		X
Number of load units per delivery (minimum, maximum, average)	X			X	X	X	
Usual hours of delivery (distribution)	X	X	X	X	X		X
Share of own account collection							
Determination of delivery hour					X	X	
Delivery time duration					X		
Share of deliveries to end customers		X					
Parking during deliveries					X	X	X
Number of destination per one round of delivery to end user			X				
Problems and suggestions (short analysis and description)	X	X	X	X	X	X	X

Table 5: Tool methodologies and data reports per FUAs

In the following figures, two of the above-listed parameters are reported through a quantitative comparison among FUAs. They show the customization of the FUA zoning and the amount of collected questionnaires on the distribution flows. The figures confirm the wide range of options in customizing the common methodologies for fitting the local FUA characteristics (i.e. population density, geographicl unitis, accessability) that ranges from the unique case of Bologna (more than 250 zones) to the remaning FUAs, all below the 25 zones adopted for the modelization of the urban freight distribution.

Similarly, the amount of collected questionnaire reflects the FUAs size (i.e. population density) and the modelization criteria of each, with the unique case of Bologna with a big amount of collected questionnaire (1200 int total) up to the case of Maribor (120 questionnaires).

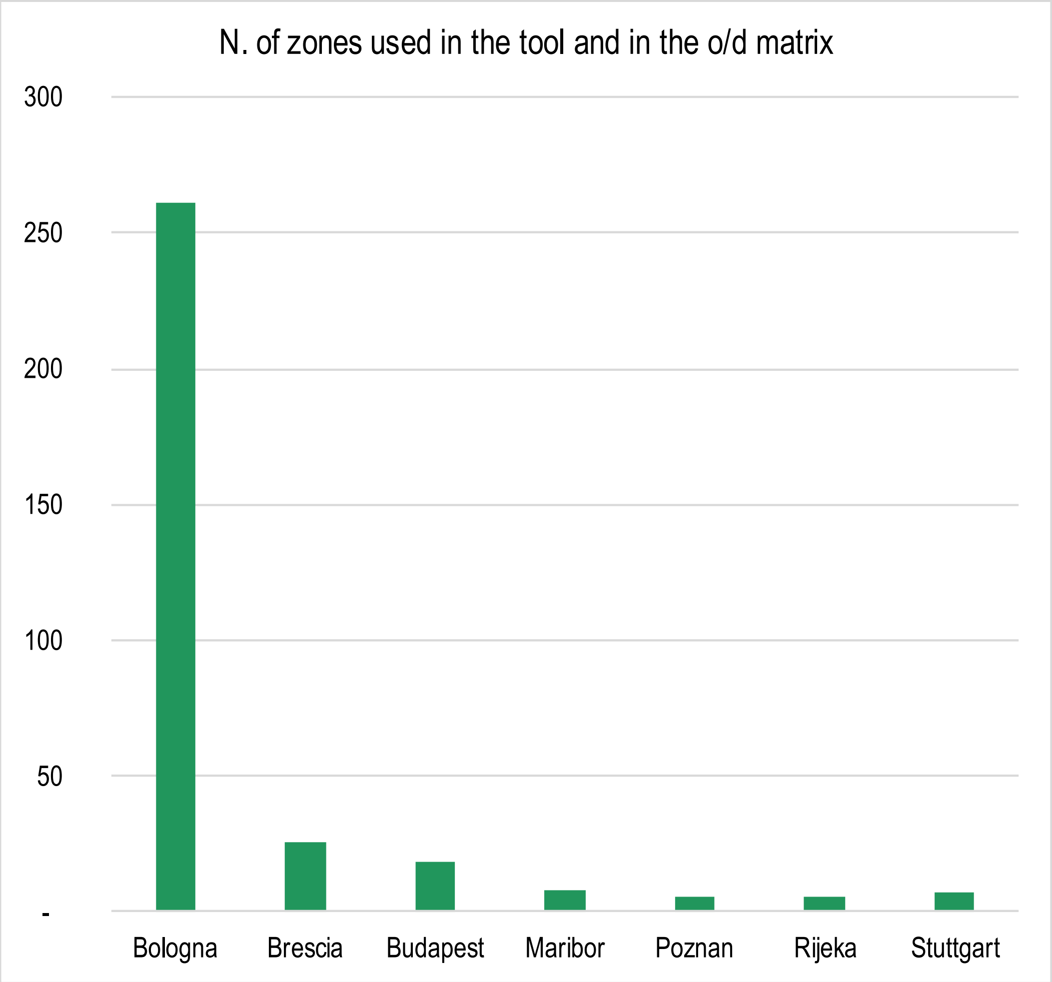


Figure 15: N. of zones used in the tool and in the o/d matrices

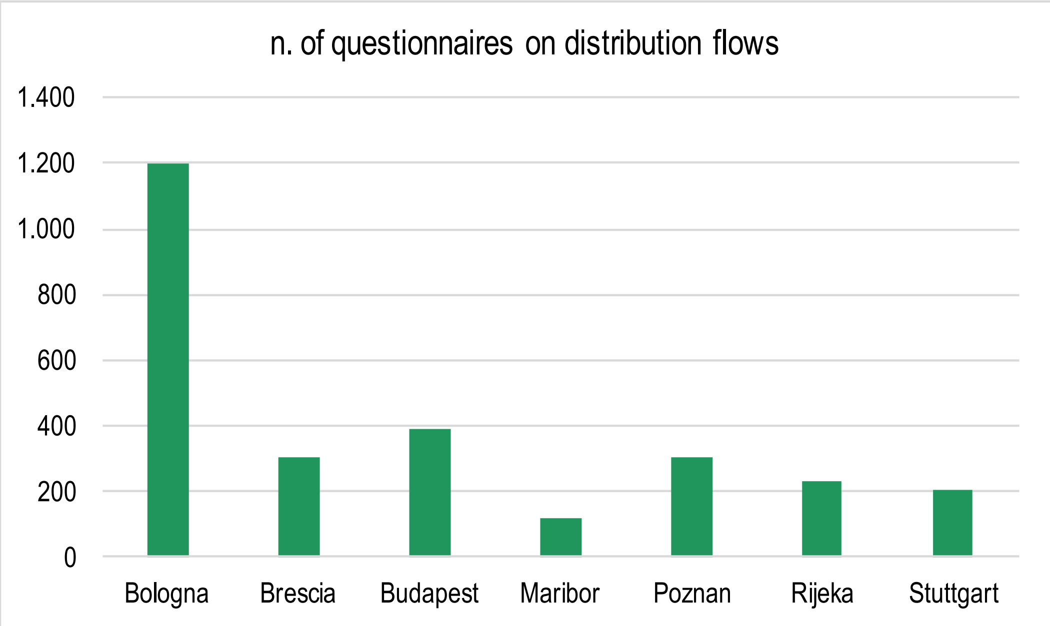


Figure 16: N. of questionnaires on distribution flows

Using the same approach, it is also possible to analyse the reports in terms of surveys to the transport operator, the elaboration of the traffic counts and LSI.

	01 - BOLOGNA	02 - BRESCIA	03- BUDAPEST	04- MARIBOR	05- POZNAN	06 - RIJEKA	07 - STUTTGART
SURVEY ON TRANSPORT OPERATOR							
Total number of interviews	X	X	X	X	X	X	X
Type of vehicles	X	X		X	X		
Distribution of trucks per fuel type			X	X			
Dimension of load Unit			X			X	
Sequence of movements (number of movements, number of stops per trip)					X		
Typical quantity					X		
Frequency of movements				X	X	X	
Load factor				X			
Parking during deliveries	X		X				

Main issues	X				X	X	X
TRAFFIC COUNTS							
Sections			X	X		X	X
MATRIXES							
Table	X	X	X	X	X		X
Chart OD	X	X	X	X	X	X	
LSI							
Actual value	X	X	X	X	X	X	X
After value	X			X	X	X	
Graph before/after	X	only before		X	X	X	Only before

Table 6: FUAs reports on survey, traffic counts and LSI elaboration

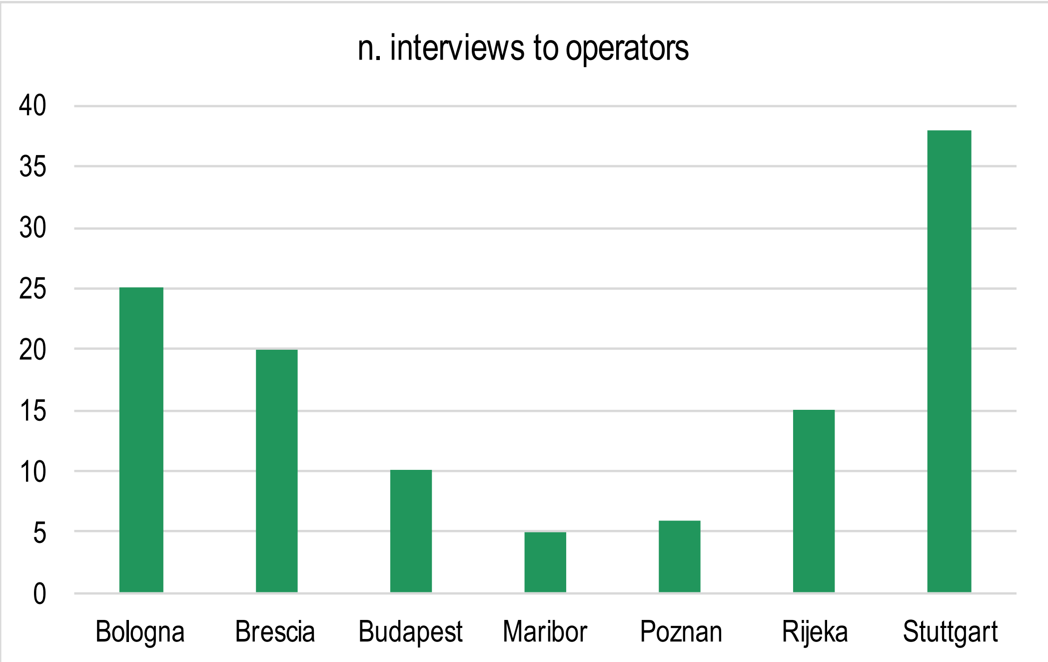
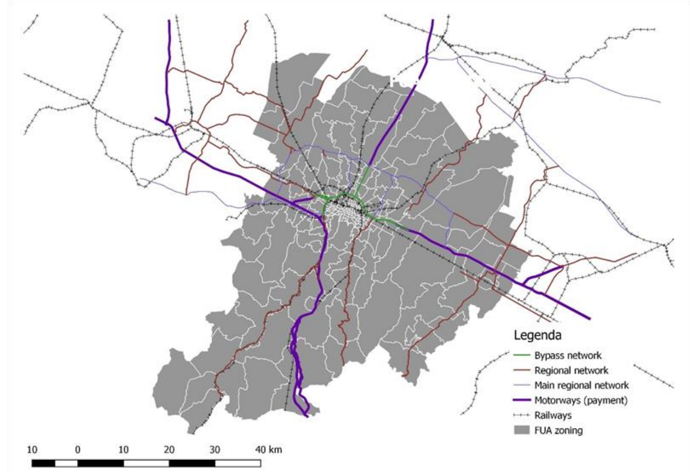


Figure 17: N. of questionnaire per FUAs

3. Schematic Results for each FUA – FUAs at the glance

In this chapter a schematic view for the methodology implemented in each FUA is provided. The purpose is not to underline detailed results, which are listed in the specific reports, but to provide the reader with a “at a glance” fact sheet. The main FUAs’ features are listed, however these fact sheets do not have the purpose to substitute the specific FUA reports but just to provide a synoptic view of different case studies. The LSI graph and a summary of the SULPiTER methodology will be provided as well when available.

01 - BOLOGNA



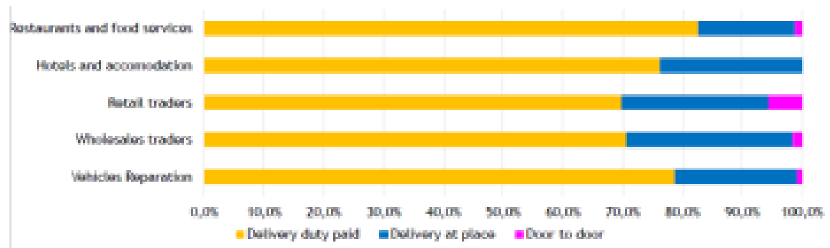
Bologna FUA

- Km² involved in the study-area: 3,703
- Inhabitants: 1,004,323
- N. of municipalities involved: 55
- N. of working units (employers): 351,710
- N. of zones used in the tool and in the o/d matrix: 234
- Zoning criteria: 6 macro areas

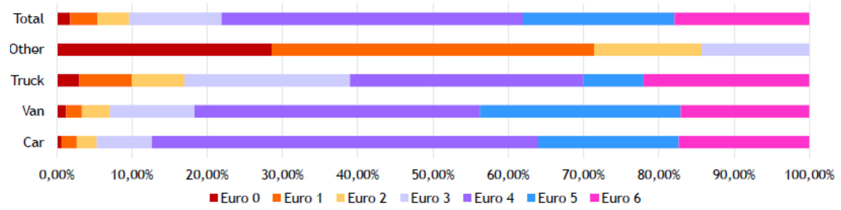
OBJECTIVES

- Use logistics to contribute in reaching targets of SUMP (short period:-20% of motorized traffic; long period:-40% GHGs emissions)
- Achieve an effective collaboration between administrations and stakeholders to develop a less fragmented strategy for FUA logistics
- Study measures aimed to shift movement of goods from motorized vehicles to railways
- Investigate and improve the freight transport relations between the Bologna urban area and the metropolitan area.
- Understand (making it more efficient) the role of the existing logistics platforms
- Reduce the overall distance covered by freight vehicles, favor freight consolidation to reduce trips and optimize utilization of vehicleOptimiseLTZ access regulations (e.g., less pollutant vehicles allowed with wider time window
- Increase the environment friendliness of the freight delivery fleet (e.g., supporting electric vehicles)

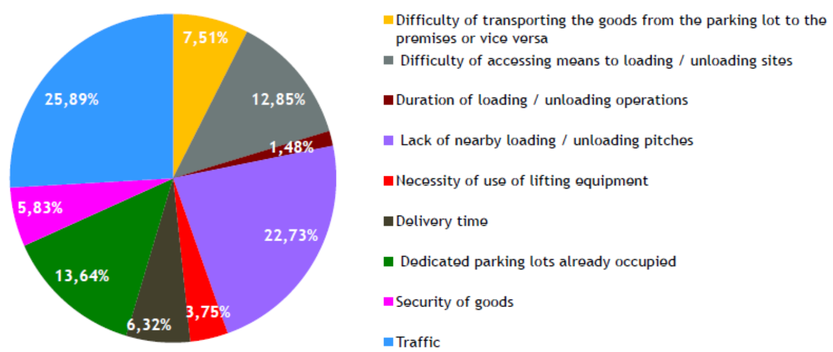
RESULTS ACHIEVED FROM THE SURVEY ON COMMERCIAL FLOWS



Type of deliveries per supply chain

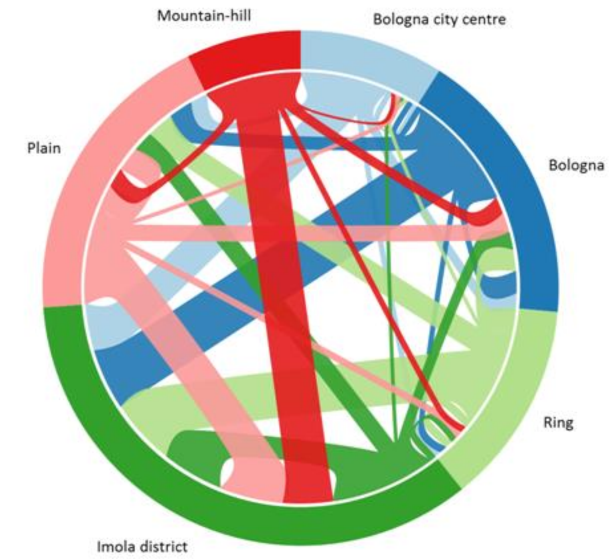


Environmental class of vehicles by type

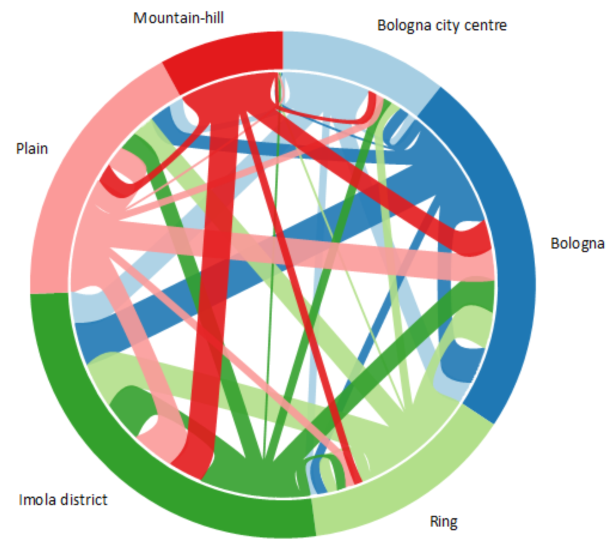


Problems revealed by interviewees

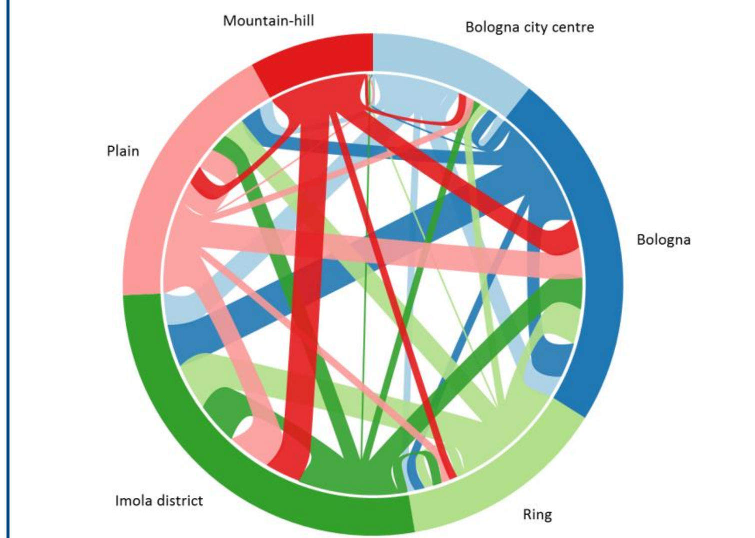
OD MATRICES



Tons/Day



Deliveries/Day



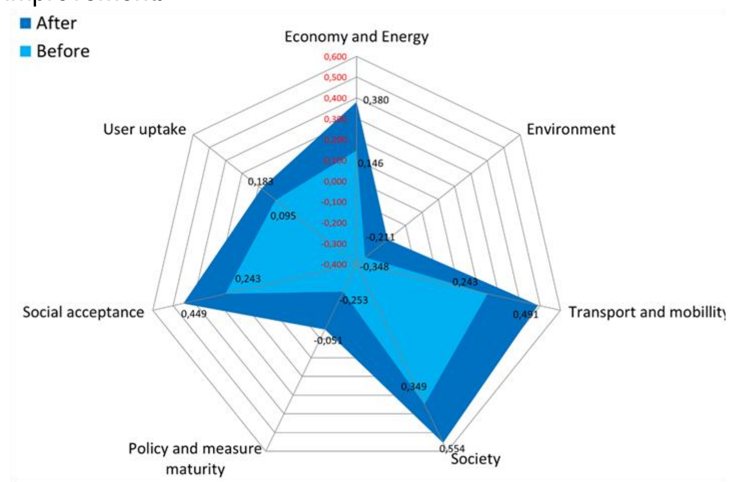
Vehicles/day

LOGISTICS SUSTAINABILITY INDEX (LSI)

Calculation of the LSI to assesses (before-after) the introduction of a city logistics measure in the FUA. Such a measure consists of:

- Multimodal distribution (railways and road) for the urban area of Bologna involving all the FUA (measure at FUA level).
- Last-mile road distribution with electric vehicles
- Logistics spaces in the inner city with cargo bike for distribution.

According to specific hypothesis derived from the above described scenario the resulting LSI (depicted below) shows an improvement.



02 - BRESCIA

Brescia FUA

TERRITORIAL CONTEXT

- 293 km^2
- 341.384 inhabitants;
- 16 municipalities;
- 18.750 productive activities, of which 7.191 related to distributive flows
- 25 zones based on the criteria of ZIP code aggregation with similar concentration of the most important categories of commercial activities.

OBJECTIVES

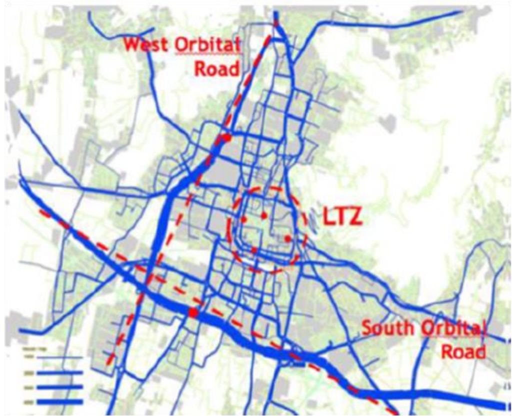
- Frame Comprehensive Picture of freight transport& distribution related to commercial activities in FUA Brescia;
- Enable Private Sector, with direct participation of commercial activities, transport and logistics operators in interviews to get actively involved in framing Brescia FUA freight flows;
- Hand over updated data, figures and information to Brescia FUA's Public Administrations to be used in elaboration of SULP and in ideation/implementation of valid measures based on concrete knowledge of current FUA's freight flows.

RESULTS GENERATED BY THE TOOL APPLICATION

- Less than 5% managed by the shop (EXW 4.7%; Off Truck 0.4%)
- 60% of supplying process managed by third party providers
- 5% "own account" managed by shop keepers
- Load unit - Box (36.2%), Carton box (29.1%), Pallet (17.8%)
- Delivery time: 57% less than 10'; 36% from 10' to 20'; 7% more than 20'
- Number of load per delivery: minimum 3.6 – maximum 29.5 – average 8.6
- Point of delivery: 42% private area; 36% on street regular parking; 12% illegal
- parking or double lane; 10% public loading bay.

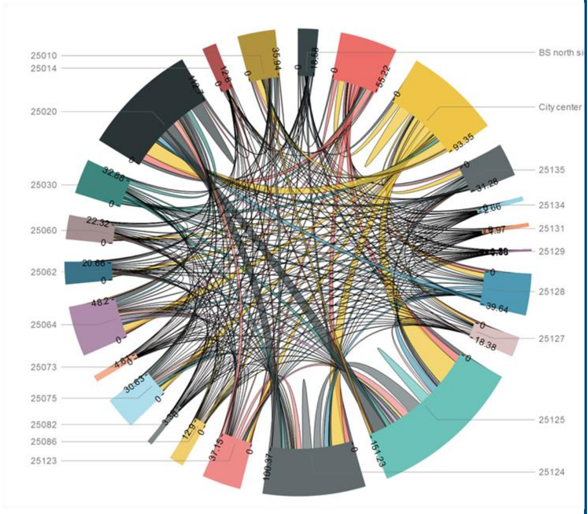
Traffic counts with focus on

- LTZ's accesses due to high density of commercial activities and relevant freight flows into the city centre
- Along two primary level roads (west and south orbital roads), due to high traffic flows.

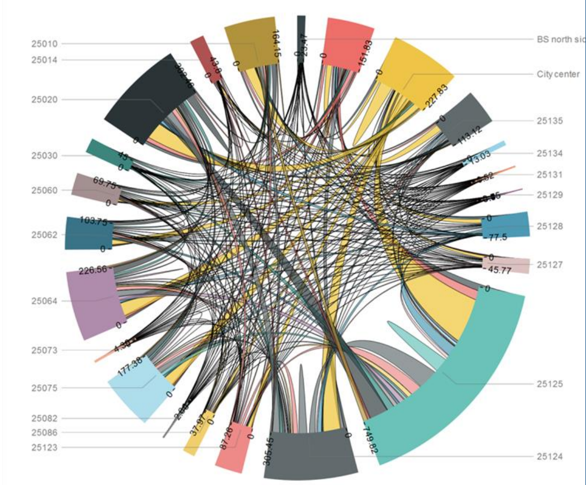


Brescia FUA: traffic count positioning

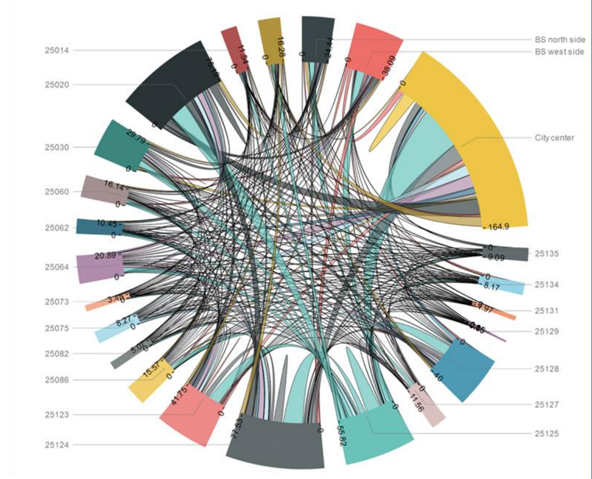
OD MATRICES



Tons/Day



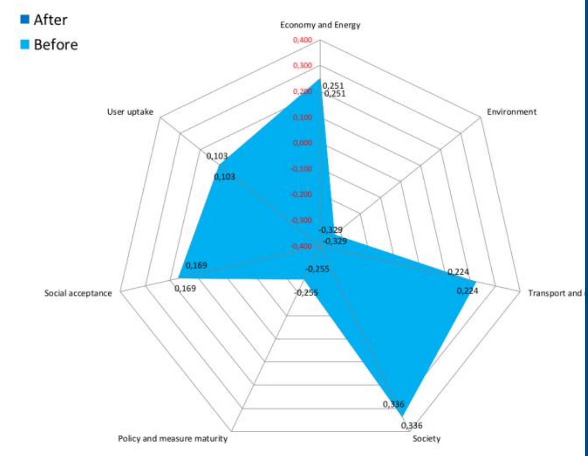
Deliveries/Day



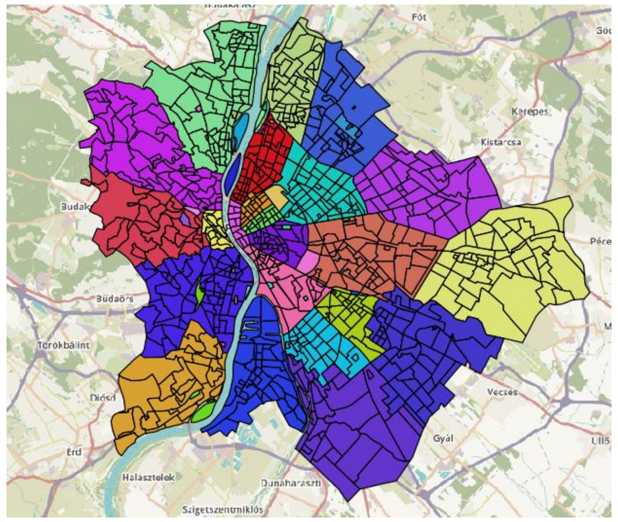
Vehicles/day

LOGISTICS SUSTAINABILITY INDEX (LSI)

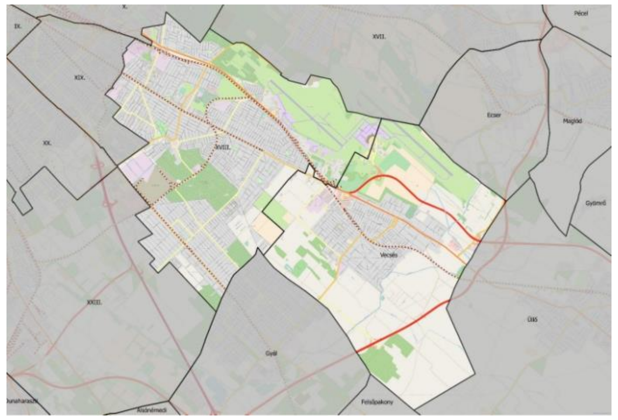
- 4 of the 7 "impact areas" show urban freight distribution system having high level in following impact areas: 1. Economy and Energy; 2. Transport and mobility; 3. Society; 4. Social acceptance;
- Medium level: 5. User uptake;
- Very low level in: 6. Environment; 7. Policy measure maturity



03 - BUDAPEST



Zones of the traffic model of Budapest



Focus area

TERRITORIAL CONTEXT

- Km2 involved in the study area: 74,78 km² for the focus area and 525 km² for the outlook area
- Inhabitants: 122 076 for the focus area and 1 733 685 for the outlook area
- N. of municipalities involved: 2 for the focus area and +23f for the outlook area
- N. of working units (employers): 3167 operating companies (focus area)/ 51369 operating
- companies (outlook area)
- N. of zones used in the tool and in the o/d matrix: Altogether 20 zones were created from the 23 district of Budapest and the city of Vecsés for the interviewing
- Alltogether 381 interview took place, 111 in the focus area 111 and 270 in the outlook area.

The FUA of Budapest has been handled on two levels:

- The focus area consists of the territory of the two project partners, the 18th district of Budapest and the City of Vecsés.
- The outlook area of our study is the area of the whole city of Budapest (the other 22 district out of the 23).

The connection between the 18th district and Vecsés is not only, that they are neighbouring areas along the boundary of the capital, but also that the Budapest Ferenc Liszt International Airport (BUD) is located among others partly in the district and partly in Vecsés.
The FUA of Budapest upon the OECD classification is categorised as large metropolitan area of almost 3 000 000 inhabitants, out of the City of Budapest, capital of Hungary has 1 700 000 inhabitants. The administrative system is very special, Budapest is composed of 23 local municipalities having almost the same rights and responsibilities as the city of Budapest.

OBJECTIVES

- Highlight the importance of city logistics as a relevant part of Budapest SUMP (Balázs Mór Plan)
- Develop a comprehensive city logistics legislation both for the city and for the regional level
- Understand the needs of relevant stakeholders in terms of urban freight deliveries
- Develop pilot actions for testing and experiencing sustainable city logistic activities, solutions

RESULTS GENERATED BY THE TOOL APPLICATION

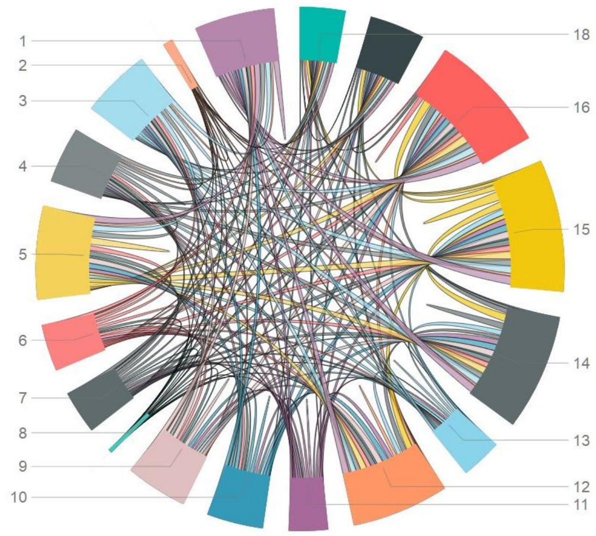
Features of the interviewed shops

- 3,5 employees on average
- 50% are below 40 m2 - 22% of does not have an inside depot
- 14% has external depot
- external depot distance from the shop is 29 km on average
- 39% has their own fleet, usually it means onlyone vehicle
- 47% of the vehicles is car, 23% van, but truck, motorcycle, cargo-bike is also used in some cases

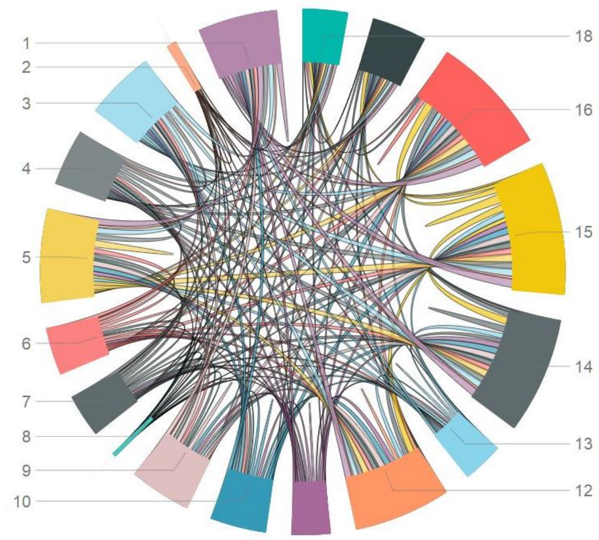
Features of the supplying process

- in 39% of the cases both the shop owner and the consignor, in 38% the shop and in 23% the consignor decides the mode of the delivery
- within all the supplying processes 39% uses the services of a third party
- 12,6% of the shops uses the services of express couriers
- 3/4 of the deliveries take place once a week or more rarely
- most common type of load units is box

OD MATRICES



All retail products, total LGV/day in the morning



All retail products, total LGV/day in the afternoon

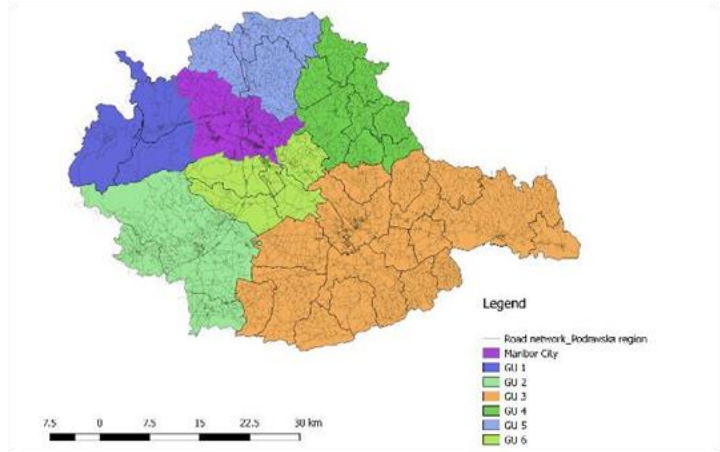
DATA INTERPRETATION

- In Budapest freight traffic access is regulated by vehicle weight, environmental category and the purpose of the delivery filtering a lot the vehicles entering to the inner part of the city.
- Deliveries are often unregulated causing congestions and disturbances for private or public transport on delivery site.
- Many delivery problems are derived from the high percentage of vehicles under 3,5t and from the lack of strict legislation on delivery times in central area.
- Impacts of dense traffic in Budapest result the instability of deliveries in time and make deliveries inefficient both for transporters and for clients

LOGISTICS SUSTAINABILITY INDEX (LSI)

- Impact area: Performance
- Economy and Energy: 325
- Environment: -0,294
- Transport and mobillity: 0,232
- Society: 0,265
- Policy and measure maturity: -0,275
- Social acceptance: 0,227
- User uptake: 0,099
- LSI : 0,579

04 - MARIBOR



Maribor FUA – Geographical Units (Gus)

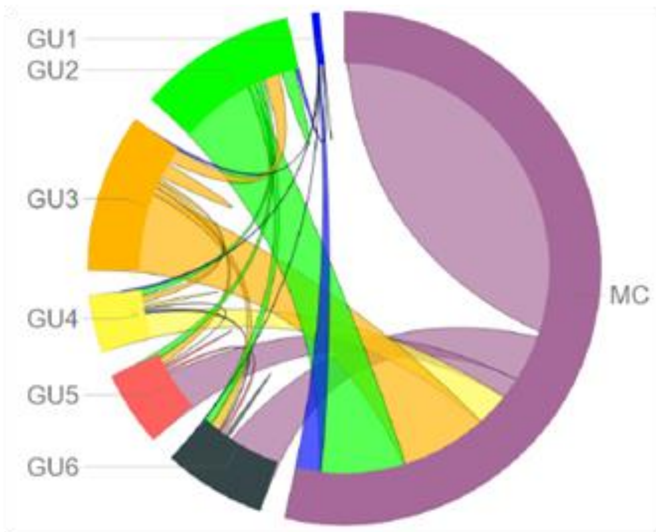
TERRITORIAL CONTEXT

- 2.107 km2 (10,7% of the Slovenian national territory
- 323.461 inhabitants (16,1% of the national population)
- 4.100 working units (G and I sector)
- 1.128 employers (foodstuffs and home accessories
- 7 zones (geographical units), Maribor City is the central zone of the FU
- Zones defend based on road network and based on major cities located within the region Only Maribor and Ptuj with reasonable city centres (all the rest are small villages)

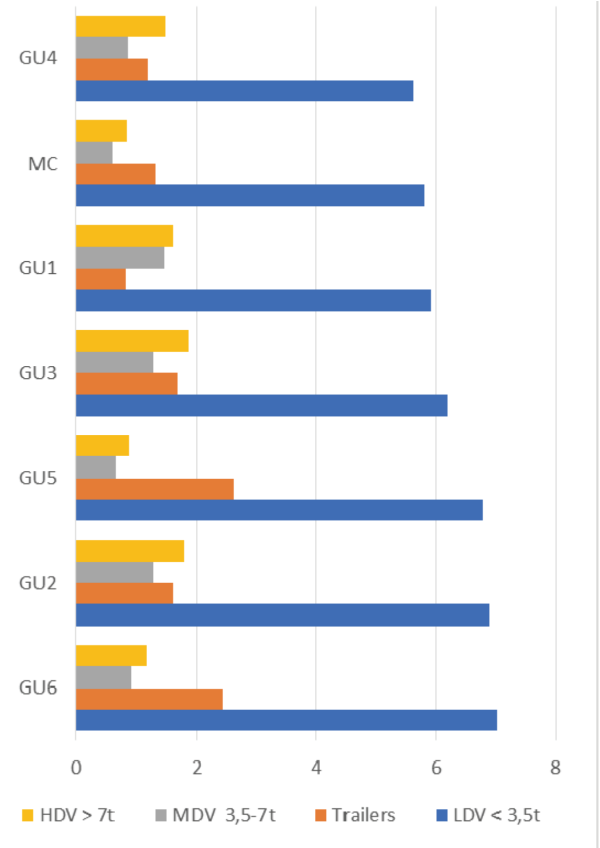
OBJECTIVES

- Regulatory measures for transit freight traffic around the city centre (signalization, enforcement measures).
- Regulatory changes (engines and fuel, access time windows, load factors, certification …)
- Load consolidation and e-vehicles for last mile delivery (urban consolidation centre – location, capacities and business model)
- Remote warehouse services (remote stock for shop owners, replenishment transport services)
- Delivery services through "Pick-up-Points" + management of Loading/unloading Areas (number, location and capacity of loading
- bays for last mile deliveries)
- Van-Sharing

OD MATRICES



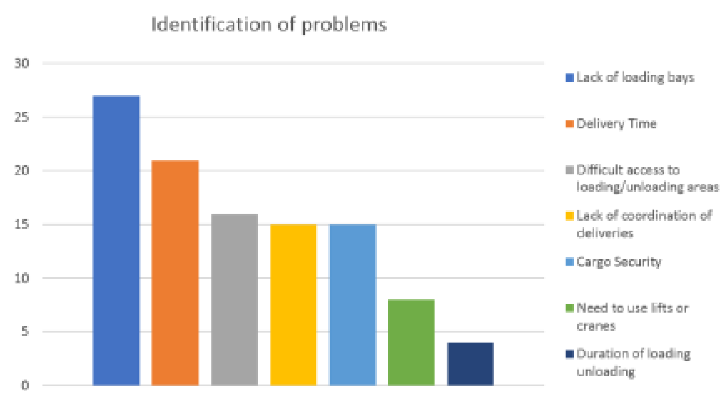
Shares of vehicle trips within and between zones (geographical units) of the Maribor FUA

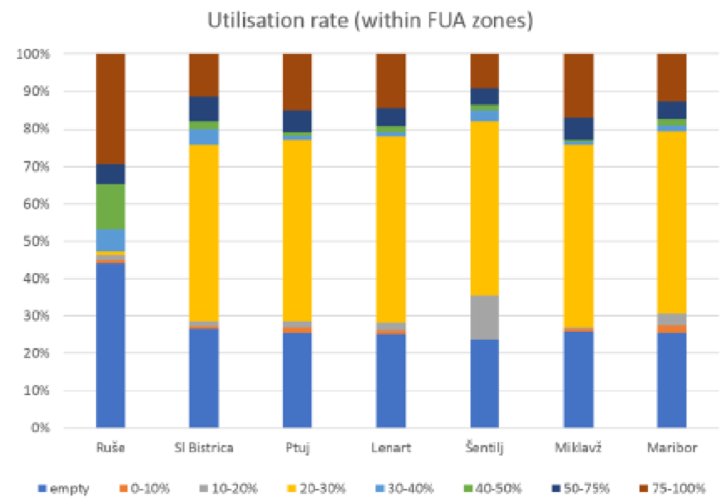


Percentage (%) of freight vehicles AADT in comparison to overall AADT (all vehicles groups)

DATA INTERPRETATION

- Majority of distribution flows with origin and destination within FUA (Maribor zone more than half of all transport trips)
- Low utilisation rate of vehicles (25% empty, only 15% fully loaded vehicles)
- Fragmentation of deliveries, concentration of deliveries in the morning period (6-10 a.m.)





LOGISTICS SUSTAINABILITY INDEX (LSI)

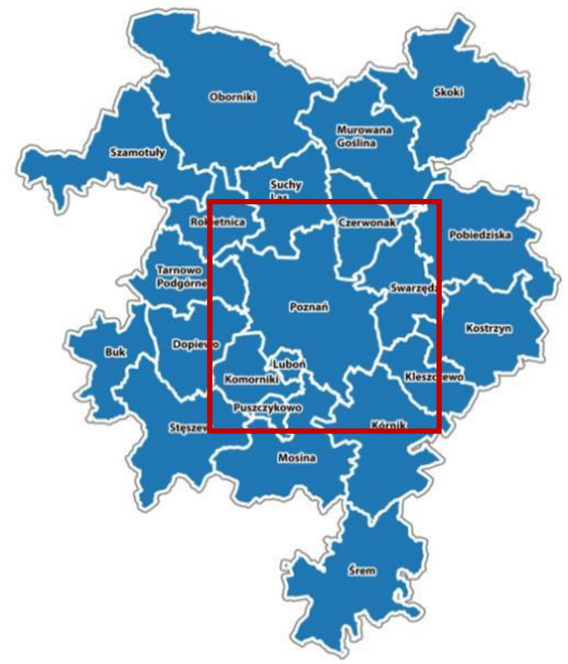
Environment

- Diesel engine vehicles
- High traffic volumes

Policy:

- Lack of stakeholders' involvement
- Information flow problems
- Data sharing restrictions

05 - POZNAN



Zones of the traffic model of Budapest

Surveyed area

TERRITORIAL CONTEXT

- Poznań FUA involved 22 municipalities
- 3.082 km^2 – Poznań FUA area
- 1.022 844 – Poznań FUA number of inhabitants
- 177.865 - Poznań FUA number of the employers
- Surveyed area - City of Poznan
- 259 km^2 – City of Poznan area
- 532.346 – City of Poznan population
- 25.328 – number of the employers
- 5 city zones used in the tool and in the o/d matrix

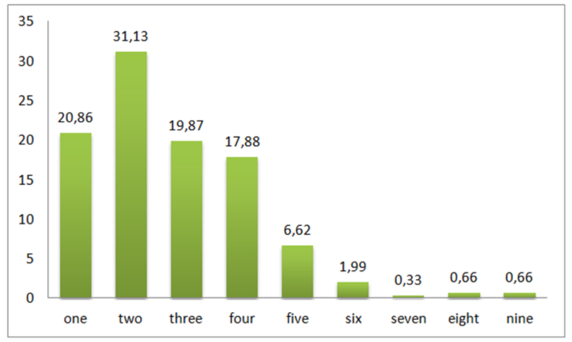
The area of the survey is the most logistically inconvenient area within the Poznan FUA due to a major problem with supplies within the city's area. In the selection of the division criteria, a significant factor was the comparability of sizes and of amounts of population of the particular districts so that they could be compared easily. The adopted variant is the most optimal of the possible divisions despite differences in sizes and populations of the zone.

OBJECTIVES

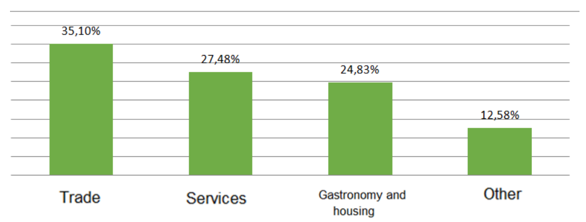
- decrease of congestions and air pollution
- holistic analysis of the condition and quality of freight transport distribution
- definition of critical flow disturbance points for freight transport

RESULTS GENERATED BY THE TOOL APPLICATION

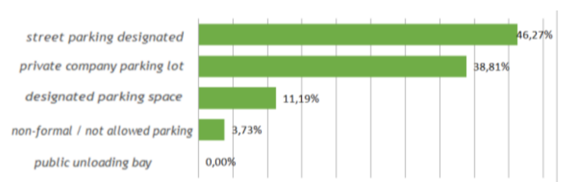
Survey sample – 302 companies



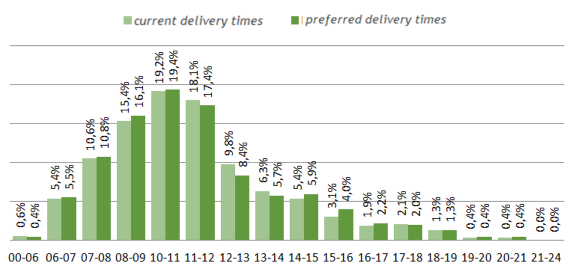
Number of employed persons



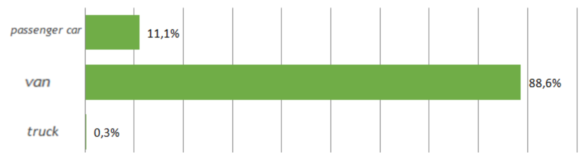
Activity profile



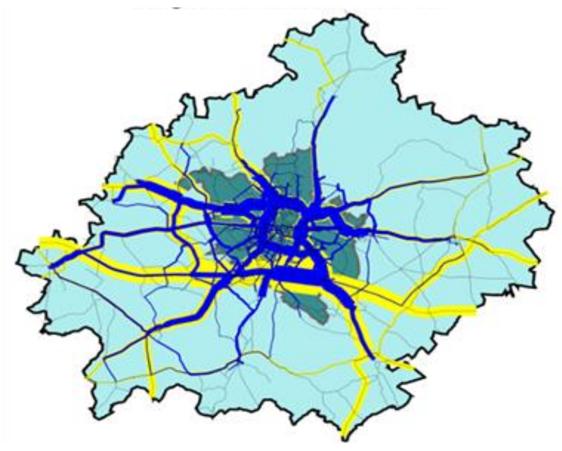
Parking places for vehicles at time of delivery



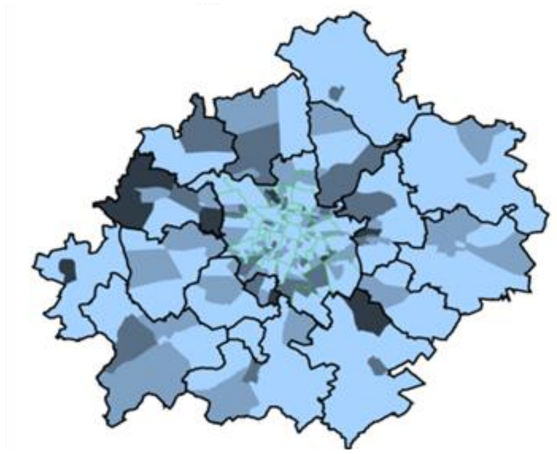
Current and preferred hours of delivery



Vehicles used for deliveries

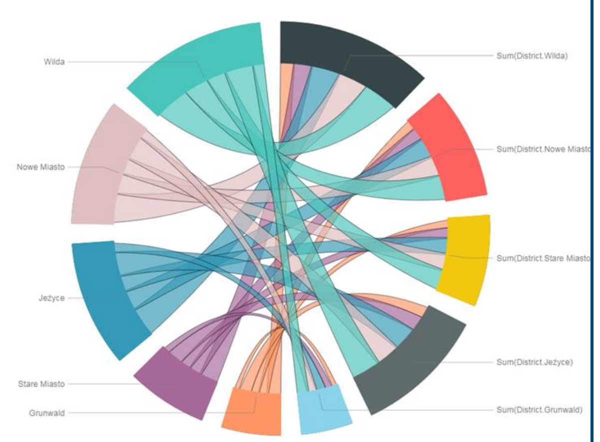


Cargo internal and external



Cargo destination

OD MATRICES

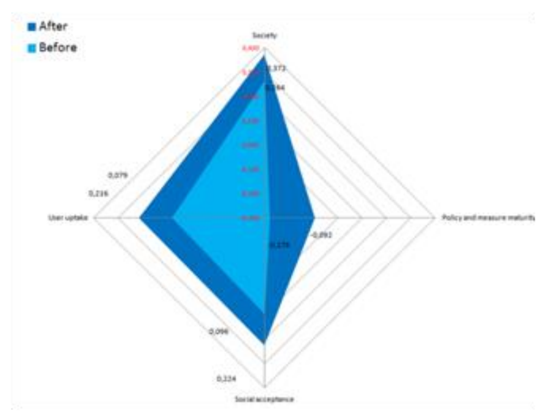


Veh/Day

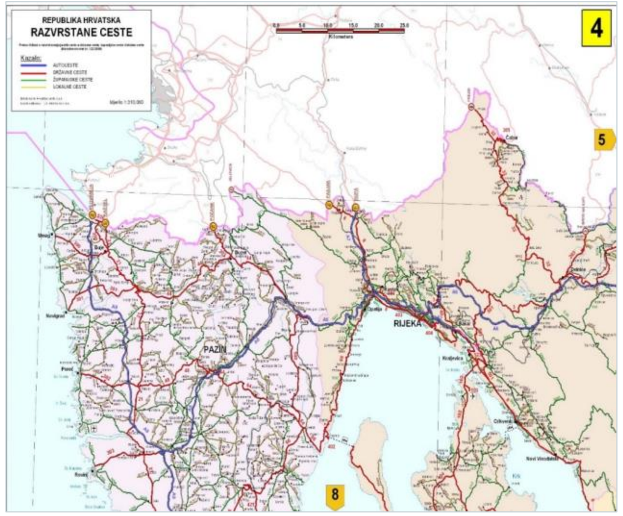
DATA INTERPRETATION

- **The vast majority of the surveyed entities have a small number of employees**, due to the specific nature of the analysed industries and Poznan enterprises structure. No difference in terms of employment compared to other surveyed companies from gastronomy and hotel sectors.
- **Most companies have 1 main supplier**. Every 3 indicates 2 suppliers, and only 13% of the surveyed entities have 3 suppliers. In a sense, this situation illustrates the level of dependence of major suppliers of goods
- **Most deliveries are made at least a few times a month**, with 1/3 of the companies using more frequent deliveries, which may be **due to very limited warehouse space**
- Delivered goods are usually imported in boxes and cartons: **delivery is generally short (up to 10-20 minutes)** and the delivered goods do not exceed several tens of kilograms
- Among the most frequently reported supply **problems: difficulties in accessing loading and unloading sites**. The sense of security of the goods suffers from that and delivery times are prolonged.

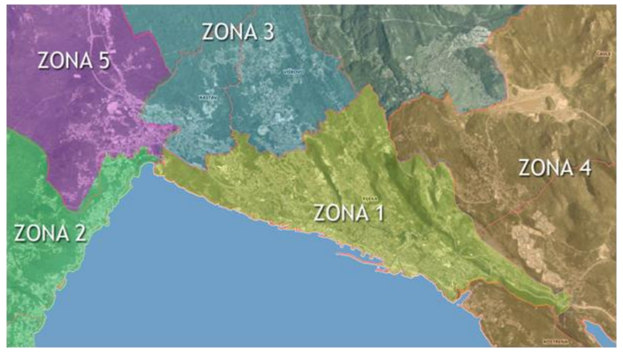
LOGISTICS SUSTAINABILITY INDEX (LSI)



06 - RIJEKA



Rijeka Road Network



Rieka FUA

TERRITORIAL CONTEXT

- Total study area: 652,75 km^2
- Inhabitants: 202.169
- 287 retail/ 1.419 employees
- 584 wholesale/1.673 employees
- 5 Cities + 5 Municipalities = 5 Zones
- Zone 1 Rijeka = Center of commercial activity = daily commuting hotspot -44km^2 / 128.000 inhabitants! –63% of FUA – 60.000 vehicles –daily
- Zone 1 – City of Rijeka – biggest commercial activity
- Zone 2 – Opatija, Lovran –tourist activity
- Zone 3 – Kastav, Klana, Viškovo
- Zone 4 – Čavle, Bakar, Kostrena–industrial zone/warehouses, highway to the inland
- Zone 5 – Matulji – CRO-SLO border

The study area covers the majority of the municipalities surrounding the City of Rijeka and Rijeka as well. The areas include territories of the Rijeka Agglomeration in which the relevant commercial activities are carried out and which are covered by more important traffic routes, including local, county and state roads, and routes to and from border crossings, bypasses and motorways.
The total area of the study area is 652,75 km^2.
The spatially smallest zone of the Rijeka FUA is the zone of the City of Rijeka. The City of Rijeka is located on the area of only 44 km^2 and has over 128.000 inhabitants, making it very densely populated and the most commercially active area in the County Primorje – Gorski kotar in which it is located.
The biggest zone is zone 4, with 221,08 km^2, that includes a large industrial zone and warehousing facilities, and is an origin for a lot of delivery routes.

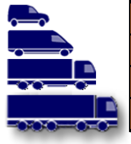
OBJECTIVES

- TO DEVELOP urban freight mobility planning policies for the Rijeka functional urban area
- TO UNDERSTAND the connections with the metropolitan area and explore new models of freight transportation
- THE SULP developed will be used as a base for the future development of the SUMP
- TO ENHANCE knowledge for low carbon mobility planning in the FUA
- TO ENGAGE in a public-private cooperation with private stakeholders in a strategic low carbon mobility perspective

RESULTS GENERATED BY THE TOOL APPLICATION

- 232 surveys completed with commercial entities
- 13 surveys completed with transport operators
- HoReCa: 101; Food products: 45; Consumer goods: 63; Textile products: 23
- DDP: 115 (45%); ex work: 13 (5,60%); off truck: 104 (44,83%); own account: 122 (52,59%)
-

Traffic counts:



Chassis	MON	WED	PEAK/DECLINE	NUMBER
0-6m	93%	93%	7-8AM/19PM	34404/33001
6-9m	4%	4%	6AM/19PM	1481/1472
9-12m	2%	3%	6AM/19PM	885/905
12-	1%	1%	6AM/19PM	192/239

OD Matrices:

QUANTITY MATRIX					
ZONE	1	2	3	4	5
t	158.148	16.725	108.699	12.61	32.22
	48%	**5%**	**33%**	**4%**	**10%**
SUPPLY CHAIN	HoReCa	Textile	Food	Consumer goods	
	34%	1%	33%	32%	

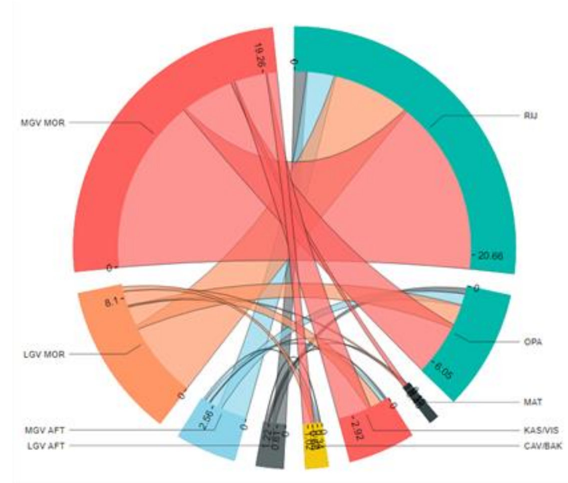
DELIVERY MATRIX *%				
SUPPLY CHAIN	HoReCa	Textile	Food	Consumer goods
RETAILER ON OWN ACCOUNT	21	52	63	33
WHOLESALER ON OWN ACCOUNT	11	17	33	54
THIRD PARTY	68	31	4	13

VEHICLE MATRIX *%				
SUPPLY CHAIN	HoReCa	Textile	Food	Consumer goods
MORNING	79	91	87	83
AFTERNOON	21	9	13	17

DATA INTERPRETATION

- Significant number of deliveries in Zone 1 (HoReCa and home accessories chains) with predominant **daily deliveries and bigger number of trips**
- Consequently, **non – homogenous distribution when considering the entire FUA**
- Even distribution of foodstuff chains considering the origin from the distribution centers in the entire FUA
- **48% of all quantity oriented to zone 1**
- pressure to deliver in morning hours on the supply side leads to **unavailability of parking positions**, and 35% park illegaly 25 % between 7-8 AM; 90% between 6-12AM, but all within working hours 59% MGV / 41% LGV considering all supply chains

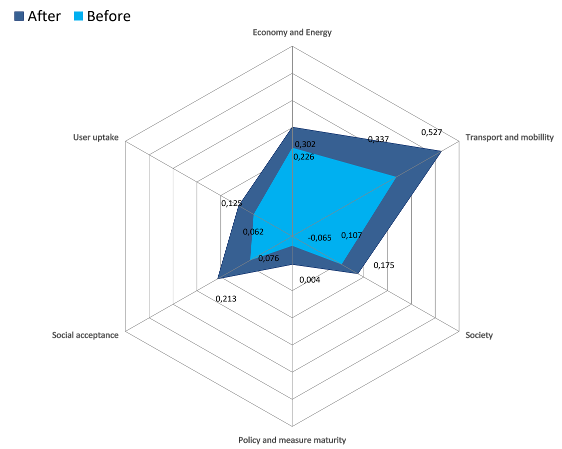
OD MATRICES



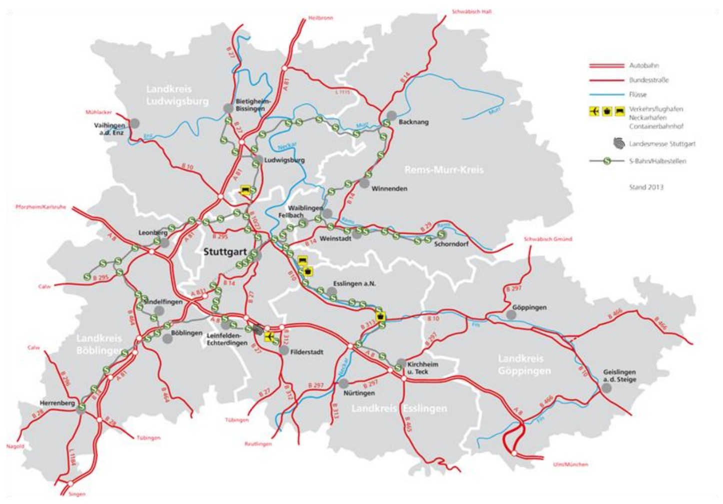
Veh/Day

LOGISTICS SUSTAINABILITY INDEX (LSI)

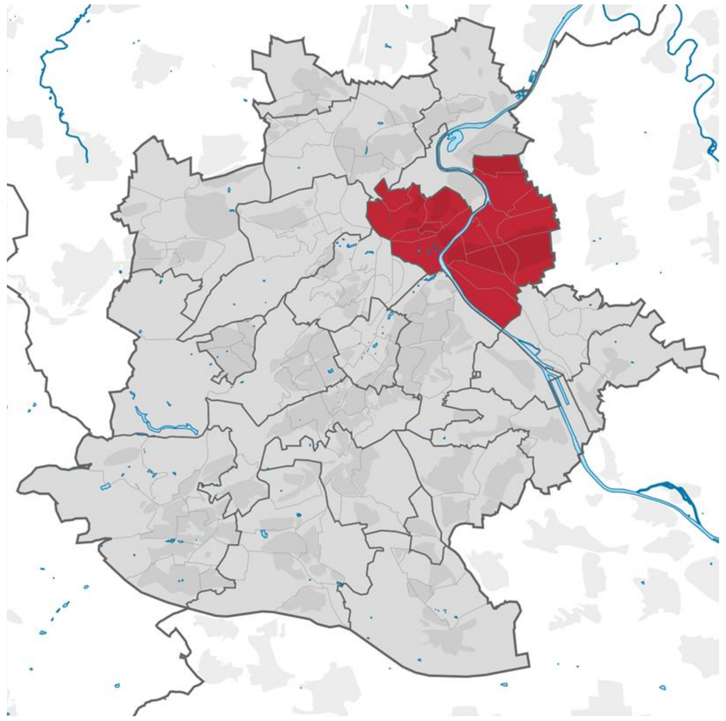
1. MEASURE: introduction of hotspot locations for unloading goods and ensuring 3rd party delivery to end users
2. EXPERT EVALUATION for the before and after scenario
3. MEASURE REQUIREMENTS: defining hotspots; equipping locations and ensuring 3rd party delivery service; signs and IT support for stakeholders; regulatory support (redefining delivery time, monitoring tools); development of an IT service for the reservation and time slot assignment



07 - STUTTGART



Total study area: Zones 1-4: "Stuttgart"; Zone 5: „Rems-Muss-Kreis" (upper right); Zone 6: Landkreis Ludwigsburg, Landkreis Böblingen, Landkreis Esslingen, Landkreis Göppingen; Zone 7: Residual area (outside zones 1-6)



Stuttgart and Bad Cannstatt: Zones 1-3 (red): Bad Cannstatt; Zone 4 (grey): Remaining Stuttgart

OBJECTIVES

- The idea to reduce both CO2 and traffic is seen under the superior goal of enforcing cleaner air.
- Understanding freight traffic flows and its interdependencies with planning and traffic decisions.
- What can we do, and which measures will cause which effects?
- Which cooperations are possible among stakeholders, and how to set them going?
- We were looking for a spatial and economic structure that exists many times across the region,
  and found it in Bad Cannstatt (see circle on map).

RESULTS GENERATED BY THE TOOL APPLICATION

- With over 200 interviews, we covered the retail sector of Bad Cannstatt. A traffic count separately covered all entrance points of both Bad Cannstatt inner precincts.
- The contribution of logistics to traffic problems is limited in numbers, but very visible especially in its disruptive potential (e.g. road blocking).
- Even the newer infrastructure (incl. Pedestrian zone) has no loading zones.
- Logistics is still not part of spatial planning issues.
- Almost all deliveries are organized by stakeholders other than the recipients (store chains, parcel services etc.).
- Most delivery vehicles are not by parcel services, but do one-stop deliveries.
- In the shopping mall, logistics works and does not use public space.

Table: Origin/Destination Volume Matrix

Zones	1	2	3	4	5	6	7
1 – Historical Bad Cannstatt	0	0	35.7	95.2	47.6	47.6	11.9
2 – Remaining inner Bad Cannstatt	0	0	27.9	74.3	37.1	37.1	9.3
3 – Remaining Bad Cannstatt	142.9	111.4	Due to the size of the cells 3 to 7 and due to the methodology, any traffic between these cells would be meaningless. Also, they are not needed for the purpose of the report.				
4 – Remaining Stuttgart	381.0	297.2					
5 – Adjoining Rems-Murr-District	190.5	148.6					
6 – Remaining Stuttgart Region	190.5	148.6					
7 – Rest of the world*	47.6	37.1					

Unit: Tons

Distance matrix

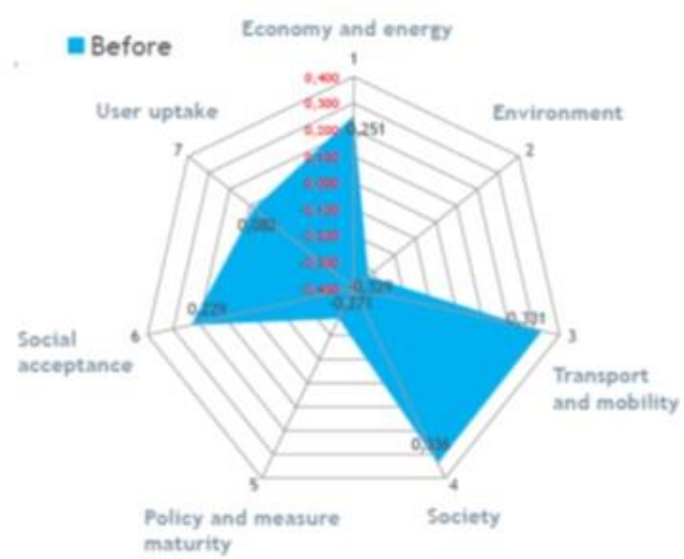
Zones	1	2	3	4	5	6	7
1 – Historical Bad Cannstatt	0	1	5	12	20	25	150
2 – Remaining inner Bad Cannstatt	1	0	5	12	20	25	150
3 – Remaining Bad Cannstatt*	5	5	Due to the size of the cells 3 to 7 and due to the methodology, any calculated distances between these cells would be meaningless. Also, they are not needed for the purpose of the report.				
4 – Remaining Stuttgart*	12	12					
5 – Adjoining Rems-Murr-District*	20	20					
6 – Remaining Stuttgart Region*	25	25					
7 – Rest of the world*	150	150					

Based upon the distance matrix, the number of trucks calculated from the traffic count, and the share of the various distances, the CO2 consumption adds up to 4,200 t/year at the very least, just for the regional transport and distribution. That is the figure for just one of 15 centers on middle level within the FAU.

DATA INTERPRETATION

- Thanks to SULPiTER, for the first time we had data from a full-scale survey, and also it is transferable.
- We were surprised about the small average size of the delivery vehicles.
- Almost all deliveries are made by vans and trucks that do just regional runs, whatever the origin of the ware.
- The delivery vehicles are part of logistics chains that are optimized for the region as a whole. There is no significant logistics hub in close proximity. Thus, the «last miles» in the region are rather long.
- Technically, the system would continue to work in the future, producing traffic and pollution. To reduce CO2-emissions, It needs political decisions. They could create options for better location of interfaces (e.g. micro-hubs) and for different delivery services (e.g. e-bikes).

LOGISTICS SUSTAINABILITY INDEX (LSI)



4. Comparison of city logistics issues

The methodology proposed by the SULPiTER project included quantitative analyses in each FUA to apply numerical evaluations aimed at assessing the impact of city logistics initiatives. Surveys based on questionnaires, interviews and traffic counting helped collect mainly numerical and quantitative information. The opportunity to carry out these activities has also allowed, perhaps as a sub-product, to gather qualitative information about the problems encountered by the main players in the city delivery process.

This chapter presents the main problems encountered in each case study. The aim was not that of listing in detail what was found in each case, but to collect and highlight the problems cross-cutting all or at least many of the study cases considered. It's also interesting to link these outcomes with the self-assessement analysis of city logistics issues of FUAs Partners (see Table 4), whether or not they have been confirmed in the practice.

As shown in the previous chapters, the study cases present considerable differences between them, since FUAs are different by size, different location in the territory, by urban planning function. Nevertheless, it seems important to underline how the problems found are mainly similar. This indications can be considered a starting point for subsequent analysis and for the definition of common methodologies.

For each case study, the main comments are reported and then the problems encountered were reported in order of decreasing importance. This will allow to allocate a score for each problem encountered, with the aim of outlining in the comparison phase a cross-classification of the criticalities found. Therefore, this chapter firstly describes the problems encountered by each case study as described by each specific report, secondly make a summary for each city highlighting the most impacting criticalities and thirdly compare the results of the different case studies identifying the common criticalities.

To standardize the collected information, some options were provided to interviewees, in particular:

- Lack of loading bays
- Difficulty to access loading bays
- Delivery hours
- Safety of cargo (during delivery)
- Difficulty to move goods from parking location to the delivery point
- Time of Loading/unloading
- Lack of coordination of Delivery

We ranked the main critical issues arose in the different case studies using a quantitative indicator, with the purpose to highlight the most relavant ones. Among the seven critical issues listed, just four of these have been selected and ranked i.e. the ones most experienced. A score from 2 to 8 have been assigned to each of the four selected issues. Where 2 was given to the issues with the lowest percentage and 8 to the higthes one.

4.1. Bologna

Among the quantitative data collected from the interviews and from the on the field surveys, qualitative indications about criticalities for the delivery process were collected both from the shop keepers retails and logistics operators. Almost all the suggested criticalities have been mentioned but the first one is the difficulty access to loading/unloading bays: this due to traffic congestions in the area and due to the occupation of loading/unloading bays from other private cars. The second problems underlined by interviewees is related to the number of loading/unloading bays that are considered not to be enough compared to the number of shops and in general of the activities that need to be reached by delivery units.

Also the difficulty to reach shops from the delivery bays is considered to be a problem, because of the difficulties to walk the distance between the bays and the warehouses while carrying goods. This issue is considered related to the planning process for loading/unloading bay identification. Delivery time slot is considered an issue too, due to the rigidity of time slots. In fact, since there is the need of flexibility in delivery hours from the users, operators suggested to remove delivery limits to make the access to urban areas more flexible and with special permits.

A minor number of stakeholders highlighted security issues during logistics operation, leading to some minor criticalities.

To sum up, in Bologna the ranking of the main problems of shopkeepers and logistics operators is as follows:

1. Difficulty to access loading/unloading bay;
2. Lack of loading bay;
3. Difficult movement of goods from parking to customers premises;
4. Delivery time.

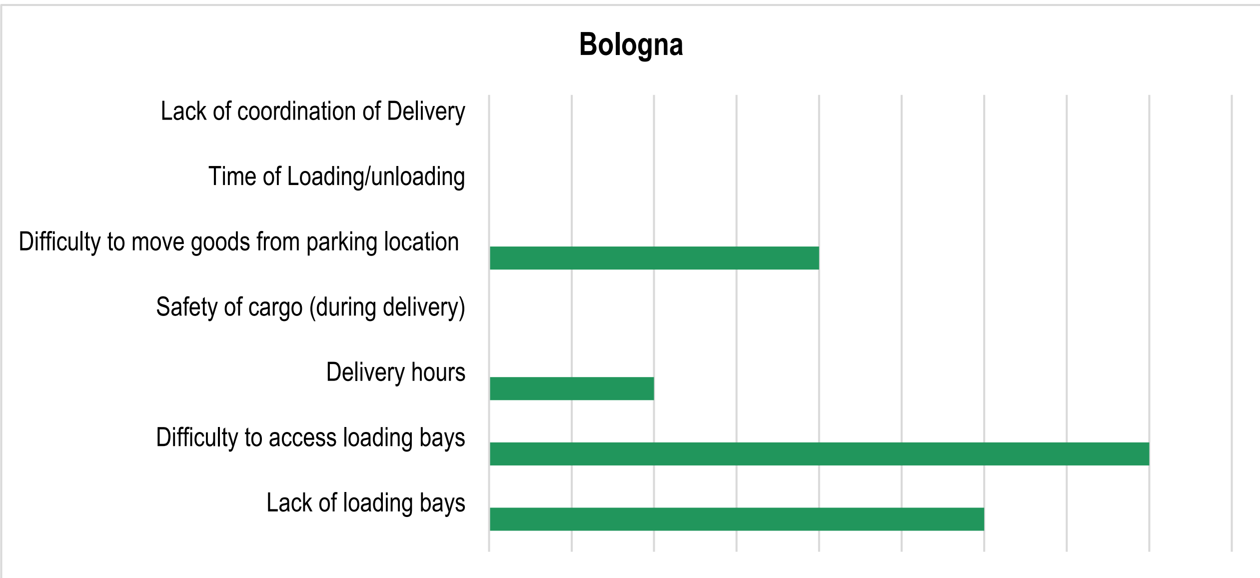


Figure 18: Bologna FUA, city logistics problems raised from the survey

4.2. Brescia

In the Brescia study case, although the majority of the interviewees did not report any particular problem regarding the distribution of goods in the FUA, some problems were highlighted.

According to shopkeepers, there is incorrect planning of loading and unloading cargo bays, especially in LTZ (city centre): in general, the spaces dedicated to loading and unloading activities are not enough, and in many cases in areas where they are not necessary. Besides loading/unloading, these areas are always occupied by residents' private cars and there is no control from traffic wardens.

The regulation for the LTZ access is too rigid: time slots are too narrow, access and parking costs are also too high. Shops/commercial activities' logistics needs are not taken enough into consideration during planning. As a result, shopkeepers have to sustain big costs for vehicle entering and parking in LTZ because there is lack of specific arrangements.

The shopkeepers' business model is characterized by low or total absence of stocks, and need to have a continuous supplying process to match the customers' requests. The consequence on the distribution model is a high flows intensity of couriers. The cost reduction is main driver of this process thus, except for specialized network (e.g. "Ad Hoc" for car repair), the handling quality level is very low.

Few interviewees reported points of the road network where traffic is often congested and lead to difficulty to access loading/unloading bay.

Main problems ranking:

1. Lack of Loading bay
2. Delivery Time
3. Lack of Coordination for deliveries
4. Difficult to access loading/unloading bay

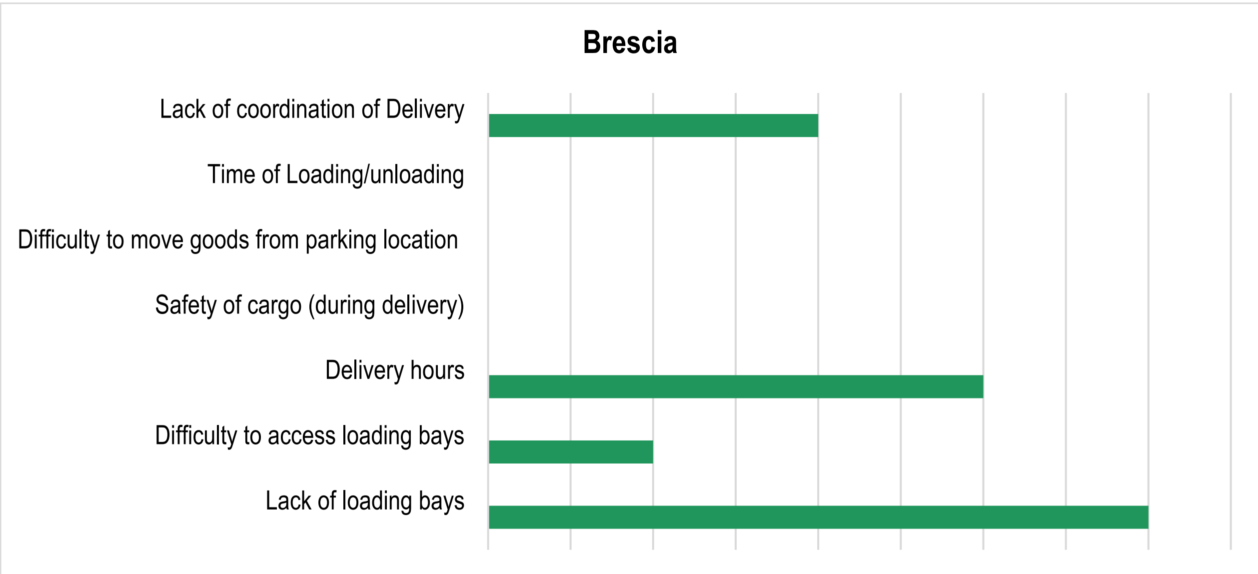


Figure 19: Brescia FUA, city logistics problems raised from the survey

4.3. Budapest

In the Budapest case study, most of the responders mentioned as main problem that the parking and loading possibilities are not suitable in the area, pointing out that in many cases the loading bays cannot be reached because of different physical obstacles. A minor number of interviewees outlined poor legislation and not optimal hours of delivery. Almost 10% of the problems reported lead to irregular behaviour in everyday situations.

One third of the responders gave some suggestions, mentioning that there is the necessity to establish more loading bays and that a change of the legislation is needed as well. About 2% pointed out the necessity to modify of the delivery time.

Interviewed operators often reported problems concerning the process of the deliveries were the lack of loading bays and the difficulty to access to the loading bays are pointed out as major problems. Missing harmonization of the different deliveries was outlined as well. As a suggestion, most of the responders said that the increase of the loading bays and parking lots would be useful.

Main problems ranking:

1. Lack of Loading bay
2. Difficult to access loading/unloading bay
3. Lack of Coordination for deliveries
4. Delivery Time

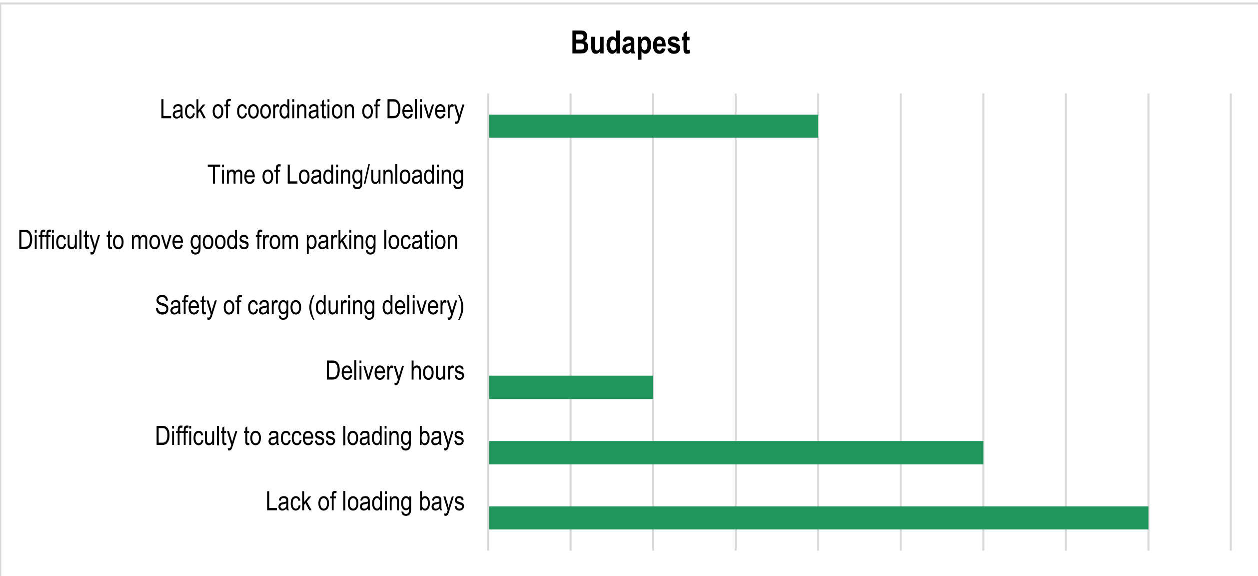


Figure 20: Budapest FUA, city logistics problems raised from the survey

4.4. Maribor

In the Maribor case study, the commercial entities underlined the lack of loading bays near their premises as main problem. These problems arises mainly because of two reasons: first, the fact that loading bays are not well positioned and second because loading bays are often occupied (by other delivery vehicles or illegally by private cars). Delivery vehicles are consequently forced to double park or to circulate around the city to find alternative loading bay not yet occupied. In case of illegal parking, retailers/suppliers are often penalized by city wardens.

Another important issued underlined in the qualitative assessment is that delivery time is limited to fixed morning time slots and fixed afternoon time slots with no other options, while operators asks for more for deliveries outside those time windows. They would rely on this option to optimize their delivery process. In addition, some interviewees said that initiatives for delivery coordination among suppliers are lacking so that simultaneous delivery are often difficult to implement. Cargo security during the delivery have beene noticed oly in few cases.

Main problems ranking:

1. Lack of loading bay;
2. Delivery time;
3. Difficult to access loading/unloading bay;
4. Lack of coordination for deliveries.

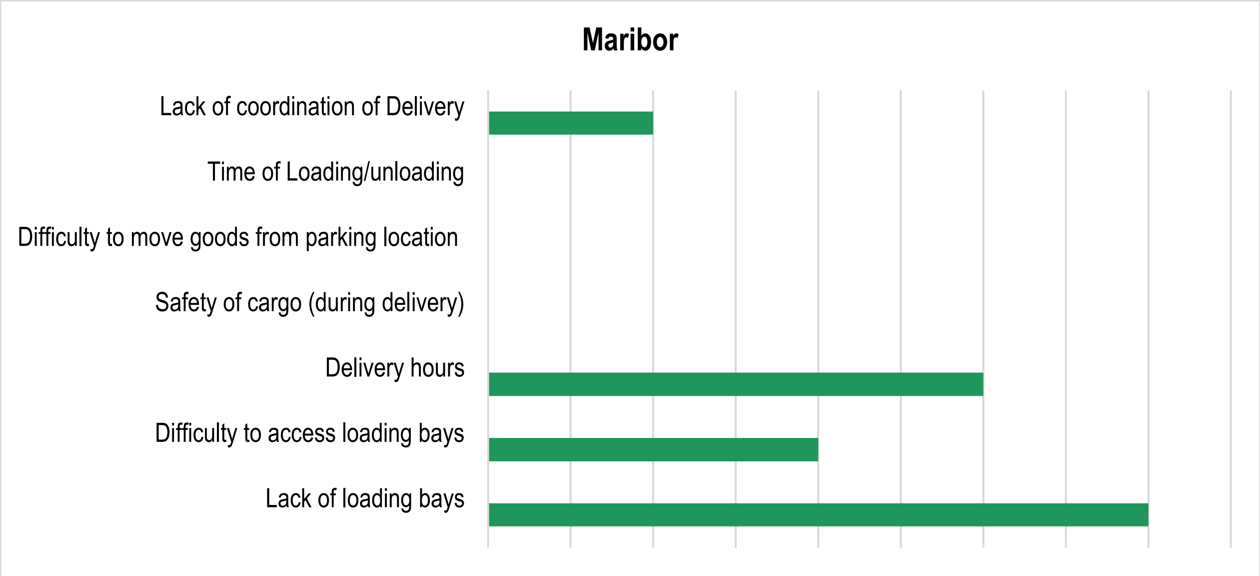


Figure 21: Maribor FUA, city logistics problems raised from the survey

4.5. Poznan

The application of SULPiTER methodology and guidelines for interviews and surveys in Poznan to collect both quantitative data and qualitative information, in particular related to problems perceived by shop keepers and transport operators during the delivery process.

The main problem that was pointed out is the difficulty to access loading bays, mainly due to traffic and irregular parking behaviours. The safety of loading is reported to be a critical issue by a large number of interviewees. Often the proximity to the main road is perceived as a treat for safety during loading/unloading process.

Delivery time is perceived as a critical issues because delivery times are rigid and not flexible as the process would require.

Even if the lack of coordination and the connection between loading/unloading bays is not perceived as critical, the time of loading/unloading is listed as a problem. It is interesting to underline that the lack of loading bays is perceived critical only by a minor number of interviewees.

Main problems ranking:

1. Difficult to access loading/unloading bay
2. Safety of Loading
3. Delivery Time
4. Loading/Unloading time

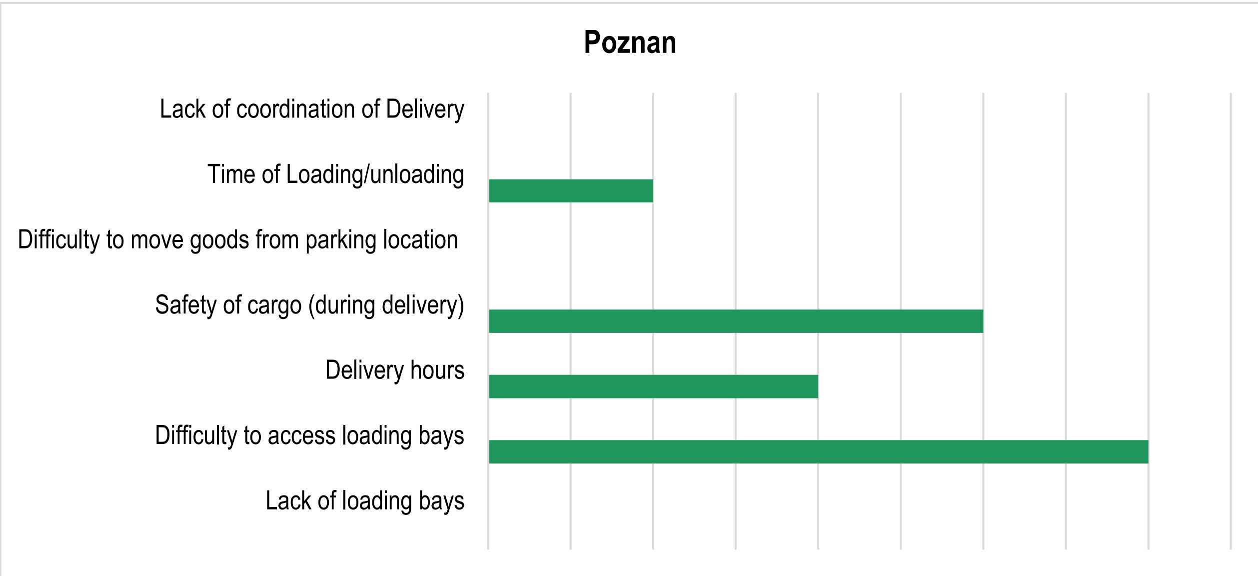


Figure 22: Poznan FUA, city logistics problems raised from the survey

4.6. Rijeka

The questionnaires and interviews held in the Rijeka case study provided the opportunity to collect indications about the main criticalities perceived by logistics operators and by shopkeepers in the delivery transport chain. Some of the occurring issues underlined by the interviewees are: lack of loading space, lack of unloading space, the need to use a forklift, the duration of loading operations, difficult access to the loading and unloading point, lack of available positions for loading and unloading, and finally lack (or absence) of coordination between deliveries.

Among these issues, the most quoted by the interviewed companies is that the delivery time slots are considered often too strict and not flexible. The second most important issue is the difficulty to access the loading/unloading bays due to traffic congestion and irregular parking habits, in particular from residents. In addition, the planning of loading/unloading bay is felt as a problem, in particular because of the distance between the bays and the shop premises, which are often long and difficult to walk with delivery units. The need of increasing the number of loading/unloading bays was outlined as well.

Main problems ranking:

1. Delivery time;
2. Difficult to access loading/unloading bay;
3. Difficult movement of goods from parking to customers premises;
4. Lack of loading bay.

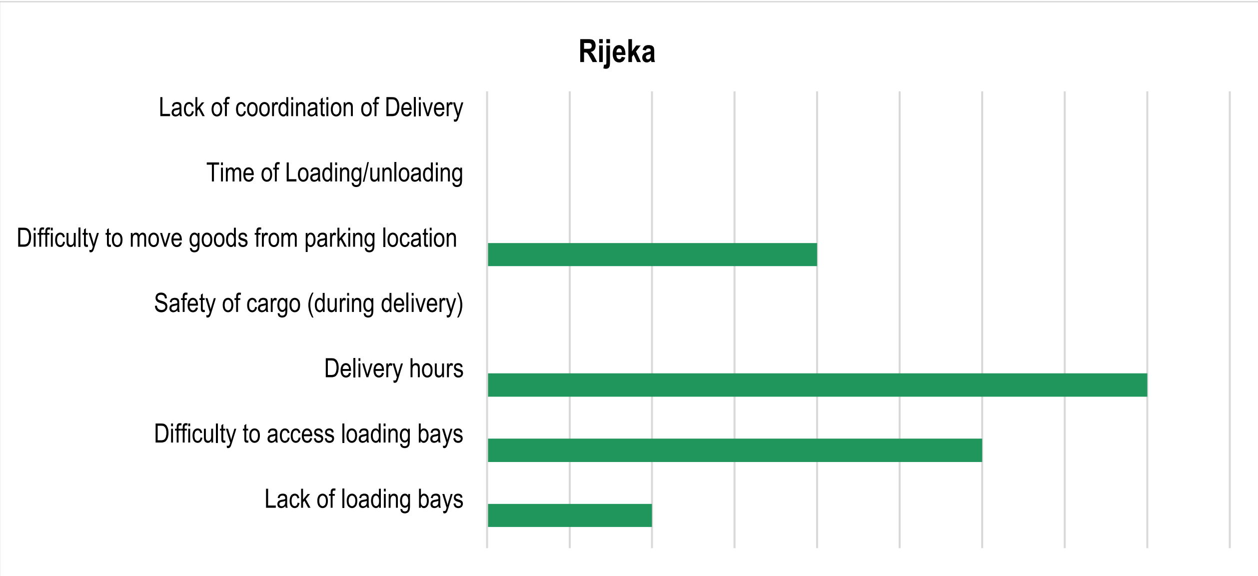


Figure 23: Rijeka FUA, city logistics problems raised from the survey

4.7. Stuttgart

For Stuttgart (Bad Cannstatt), the survey resulted in a limited amount of problems regarding deliveries. The shopkeepers explained that parking of the delivery vehicles is not an issue within the pedestrian street, since the drivers can park their vehicle anywhere during the delivery time slot. However, outside the pedestrian street it clearly is a problem. It was also found that delivery to the main shopping mall is not a problem, since the rather new shopping mall had been planned with deliveries in mind. Logisticians were clear to point out that this was exceptional also in Stuttgart Region, and that deliveries to larger malls is a problem within the area.

It must be noted that the rather few problems encountered are a result of not surveying the inner city, as was done in other FUAs, but surveying a typical mid-size center of which the FUA has about 15. As other surveys have shown, the inner city of Stuttgart has problems similar to other larger cities.

Ranking of main problems in Bad Cannstatt as a typical smaller center within the FUA:

5. Lack of loading bays
6. Delivery hours;

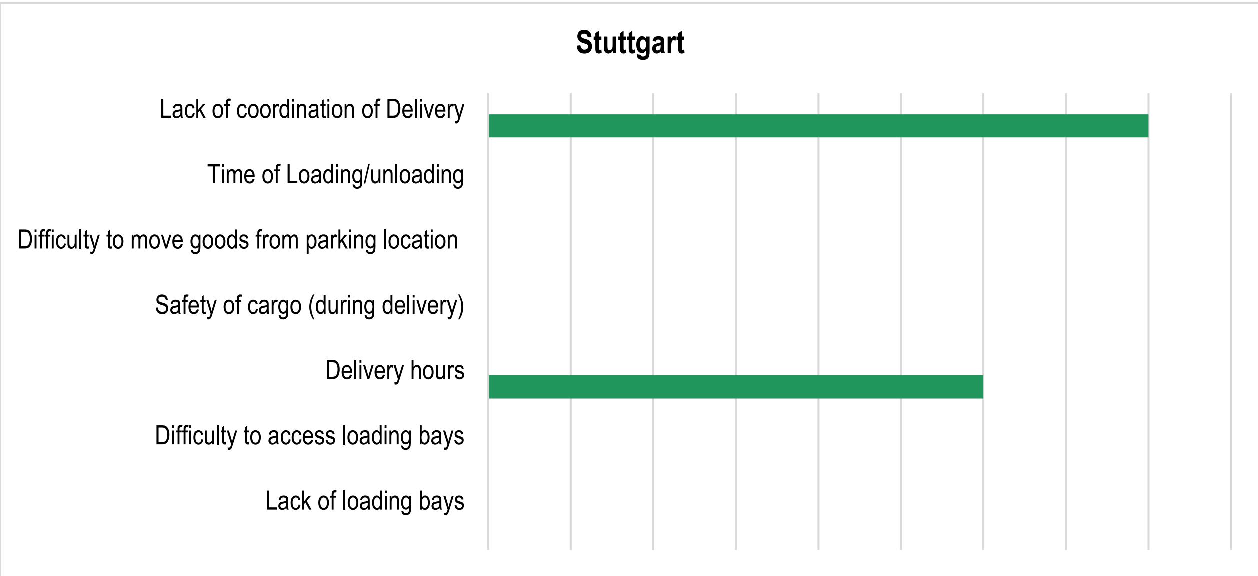


Figure 24: Stuttgart FUA, city logistics problems raised from the survey

5. Conclusions

<u>Common city logistics problems among FUAs</u>

Most of the problems found in each FUAs are common and transversal, even if the surveys were conducted in different ways, in terms of extension of the study areas and geographical coverage. As it clearly appears from the comparison graphs above, there are three main issues that are considered critical and cross-cutting in all the case studies: difficulty access to the loading bays, lack of loading bays, and rigid delivery hours.

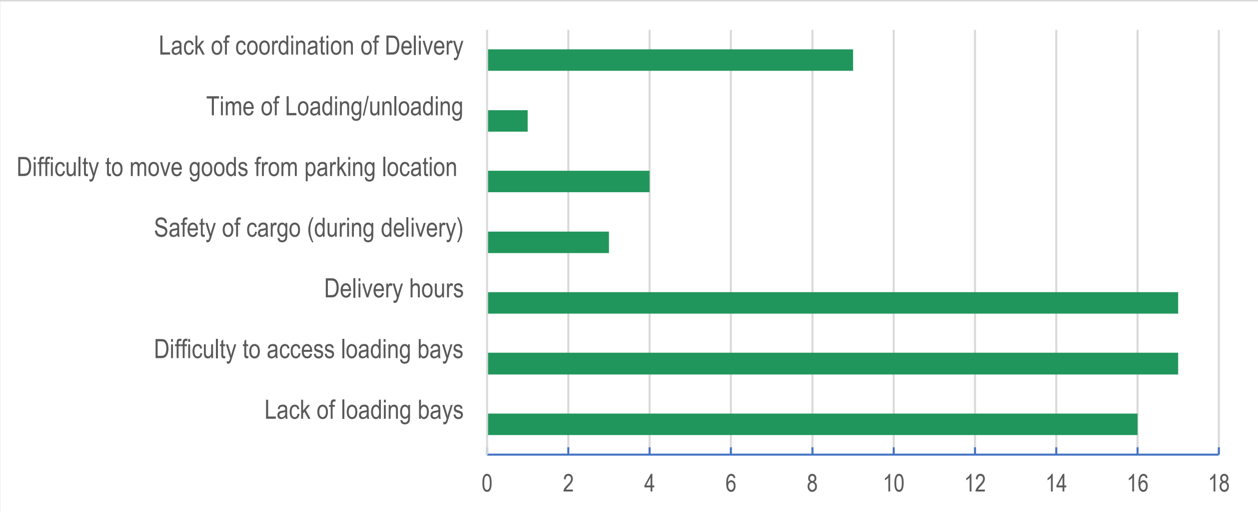


Figure 25: SULPiTER FUAs, city logistics problems raised from the survey, comparison

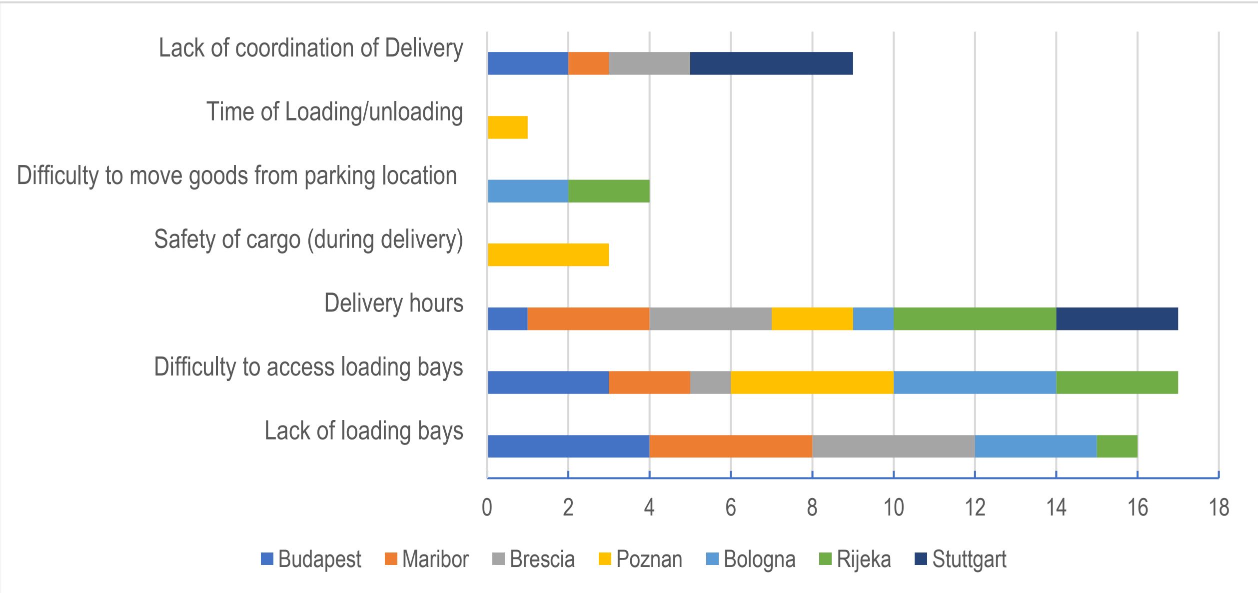


Figure 26: SULPiTER FUAs, city logistics problems raised from the survey, comparison per FUAs

Considering that over 70% of the EU's population lives in towns and cities and this growth is set to continue (85% estimation for 2030 horizon), the complexity of urban contexts and the significance of urban freight transport on the core urban node is expecting to increase in the coming years. Linking this trend to the results achieved from this part of the methodology, some useful indications for future implementations of city logistics policies could be provided.

Looking at the insights of the FUAs survey, it seems that the basic issues of the urban freight distribution are yet to be solved, although enormous efforts was put for improving the logistics delivery process in the past decade. Some additional measures should to be taken into consideration, both in the planning phase and in the regulatory framework. According to shopkeepers and logistics operators the planning phase should better identify the location of loading/unloading bays. In addition, regulatory policies should be better applied to improve the accessibility of loading bays as irregular parking habits and congestions are strongly influencing the possibility to use them.

Results usability: dual layer approach to the city logistics at FUA level

From a quantitative point of view, comparisons among FUA's results have to take into consideration many different aspects and peculiarities of the FUA territories. These aspects led to specific customization of the tool methodology for a wide set of aspects, all linking to the specific needs of each local context: number of zones used in the tool and in the O/D matrix, zoning criteria, and surveys' methods.

For this reason, the insights from the FUAs' results suggest some conclusions in terms of the usability of these data within the decision making the process of the SULP in each FUA. With few differences between FUAs, the data from the SULPiTER model were used for strategically testing a dual layer approach to the city logistics policies.

In the SULPiTER FUAs, consumer-related activities (retail, financial and administrative activities) are located in central areas. Traffic density is high and congestion widespread, due to narrow streets and designated pedestrian zones or streets. On the other hand, the remaining suburban areas of FUAs have lower levels of accumulation of urban activities. As suburban areas offer accessibility to metropolitan markets, they are highly attractive for logistics activities. The spatial pattern is commonly multi-centric with clusters of production and distribution activities as well as large terminal facilities (e.g. airports, rail stations). Distribution highly relies on road transport, as there are limited opportunities for alternative forms of distribution.

Within this common ground among the Partners cities, the focus turns on the usability of quantitative methods (such as the SULPiTER tool) and how they could effectively supporting and facilitating the decision-making process and policies applied in each local context.

Having a look also at the work on SULPiTER's WPT2 and WPT3, running alongside the "understanding" phase of the WPT1, FUAs Partners are using these results for implementing the local SULPs (especially in the dialogue with the local stakeholders), often with a dual-layer approach.

The quantitative data coming from the SULPiTER model are feeding the discussion on the measures that should be included in the plan, contributing to build a joint vision of the current state of city logistics and their main problems. The focus here is on the city centres, stressing and confirming the usual and limited territorial target of public regulations. Under this aspect, the ambitious of governing the city logistics in terms of measures application at a metropolitan / FUA level is demonstrating not yet at the top of the Cities Partners' agenda. This is due to a set of local conditions (i.e. governance structures) and, above all, to their traffic and territorial organization that the data from the model are confirming.

<u>Upscaling process in approaching the city logistics issues</u>

The quantitative data at FUA level is feeding the strategical approach of cities organizations in exploiting synergies among different territorial levels in the medium-long term. Looking at the “governance” aspect of the work which is the focus of the WPT2, data on the logistics relation between cities centers and the surrounding urban territories are building the basis for “up-scaling” the city logistics issues from a city center perspective up to a wider view. This is, indeed, a totally new approach to the urban freight distribution. With this approach, the focus is shifting from a congestion and pollution reduction perspective (the traditional approach of the city logistics policies) to a focus including also the optimization of logistics flows in a combination of B2B and B2C short distance links within extra-urban areas.

The upscaling process is still at the beginning; data are contributing in sharing knowledge and expertise among Authorities of different territorial levels and for emerging common problems. This sets the ground for setting up the proper tools for approaching the city logistics policies at FUA level in the years ahead. This is clearly visible in Bologna, which is using a set of strategy and measures for logistics in the wider metropolitan area (i.e. new regulation of settlements for logistics). In the case of Rijeka and Budapest, it is noticeable with the crucial involvement of the intermodal freight nodes (port and airport). Finally, the upcscaling process can be observed in Brescia too, where the authority has the goal of feeding the regional policies with the forthcoming “regional guidelines for the urban freight distribution”.

The “dual layers” approach adopted by the FUAs Partners underlines a series of specific challenges to address. The main one is whether the two components (city centres logistics and suburban logistics) should be dealt with converging or diverging strategies. The possible factors of divergence could include:

- Increase the constraining regulations for the city center. This strategy might encourage urban freight operators to adopt a well defined dual distribution strategies: (1) a city logistics distribution channel with adapted vehicles and operations, and (2) a suburban distribution channel with standard operation procedures.
- Emergence of e-commerce. High density areas create benefits of consolidation due to higher loads and concentrated demand, while low density areas which offer higher accessibility and less parking constraints are favouring of the benefits of lower delivery cost. These differences may induce dual distribution strategies from specific sector, i.e. the parcel distributors.