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SULPiTER

SUSTAINABLE LOGISTICS PLANNING IN CENTRAL EUROPE

Outcomes and results from the SULPiTER project

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Final Publication, May 2019

Instytut Logistyki i Magazynowania

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CENTRAL EUROPEAN INITIATIVE

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GRUPPO BRESCIA MOBILITÁ

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Wirtschaftsförderung Region Stuttgart

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CONTENTS

ACRONYMS

CE	Central Europe
EC	European Commission
ELTIS	Urban mobility observatory
ENCLOSE	ENergy efficiency in City LOgistics Services for small and mid-sized European Historic Towns
EU	European Union
FQP	Freight Quality Partnership
FTA	Freight Transport Association
FUA	Functional Urban Area: A functional urban area consists of a city and its commuting zone. Functional urban areas therefore consist of a densely inhabited city and a less densely populated commuting zone whose labour market is highly integrated with the city (OECD, 2012)
Ho.Re.Ca	Hotel/Restaurant/Café - abbreviation for the food service industry
ITS	Information Technology system
LGV	Large goods vehicle
LSI	Logistics Sustainability Index
LTZ	Limited traffic zone
MGV	Medium Goods Vehicle
MRS	Macro Regional Strategies
O-D matrix	Origin/Destination of freight movements matrices
RFI	Railway infrastructure manager
SULP	Sustainable Urban Logistics Plan
SULPITER	Sustainable Urban Logistics PlannIng To Enhance Regional freight transport
SUMP	Sustainable Urban Mobility Plan
TEN-T	Trans-European Transport Networks
ZEV	Zero Emission Vehicle

Foreword

Urban areas cover just 2,8% of the global land area, yet they are home to more than half the world's population, and trends say that 70% of Europe's population will be urban by 2050[1].
In just 20 years, without actions, our cities will become more congested, less safe, more polluted and in general increasingly complex in terms of livability and mobility. Indeed, transport is the second largest energy-consuming sector, with a 32% share of final energy consumption, 23% of transport greenhouse gas emissions. Moreover, it is the main cause of air pollution in cities, and according to OECD, 20% of energy consumption is attributable to freight transport.
Public Authorities and the European Commission are now facing this problem with several statements, suggestions, rules, agreements, and with the ambitious target to make logistics in cities become CO_2-free by 2030.
In the last years most of the EU cities and metropolitan areas worked on the definition of measures to plan the mobility of the future, with good expected results. However, logistics is still not faced with the same importance as that of passenger mobility. Freight activities are vital for the economic development of a city like commercial activities, private needs, public services but also to guarantee the social inclusion and further economic development of metropolitan areas[2].
SULPiTER tackles urban freight problems in the perspective of FUAs, taking into consideration the functional transport and economic relations between inner urban centres (the usual and limited territorial target of public regulations) and the surrounding urban territories, as well as the functional transport and economic relations within FUAs not affecting downtowns.
During the project activities, it was evident that cities do not have specific competences in last mile distribution. This lack of knowledge is even bigger and staggering if the team in charge of the Sustainable Urban Logistics Plan (SULP) is multidisciplinary, as requested by the SUMP methodology. In addition, perception on logistics trends from public administrations and private operators are very different. For these reasons, the development of a SULP must consider different stakeholders, different points of view and in some cases different priorities compared to passenger mobility.
This document aims to provide the vision of the SULPiTER project on the SULP development at functional urban area level, and on SULPs as specific planning documents mainstreamed into the SUMPs. The SULPiTER project is made of 7 FUAs represented by 14 Partners located in Central Europe: Bologna, Budapest, Poznań, Brescia, Stuttgart, Maribor and Rijeka, which are representative of typical Functional Urban Areas. These FUAs worked for three years in cooperation with technical partners, in a transnational policy capacity building exercise. The objective was to develop a transnation-

al analytical and governance tool, resulting in improved and adopted policies for the future energy and environmental sustainability of freight transport in the involved FUAs.
To address these challenges and in line with the guidelines to implement SUMP, a multi-dimensional approach was needed assessing new forms of mobility in all transport modes, their infrastructures, spatial-economic development, environmental and quality-of-life issues, governance issues across spatial and institutional levels and operators and user behavioural aspects. This exercise was carried out by project partners in order to develop actions which result in a clear understanding of cost-effective strategies, measures and tools. The target was not easy to be achieved, and the activities carried out by the FUAs in SULPiTER are to be considered as the first step of an action plan to achieve the essentially zero emission city logistics by 2030.
The SULPiTER working group, coordinated by the Institute for Transport and Logistics – ITL, has brought together tens of civil servants, logistics managers, researchers who worked to shape the future of urban freight distribution in Central Europe cities and FUAs.
The contents of this publication are based on the work of several partners who jointly analyzed and developed methodologies and templates thanks to a transnational cooperation, with the ultimate goal to develop the Sustainable Urban Logistics Plan in seven FUAs. Moreover, SULPiTER also involved other non-partner organizations through the Enlarged Transfer Programme, which ensured the possibility to use the methods also in other contexts. This programme was more than just sharing activities as it was possible to validate the procedures at transnational level.
From the Coordinator's perspective, SULPiTER has represented an edge and heterogeneous forum, bringing new technical skills for public authorities in policy making, a permanent public-private dialogue and most of all the improvement of city logistics policies of the organizations involved.

Giuseppe Luppino
Senior project manager
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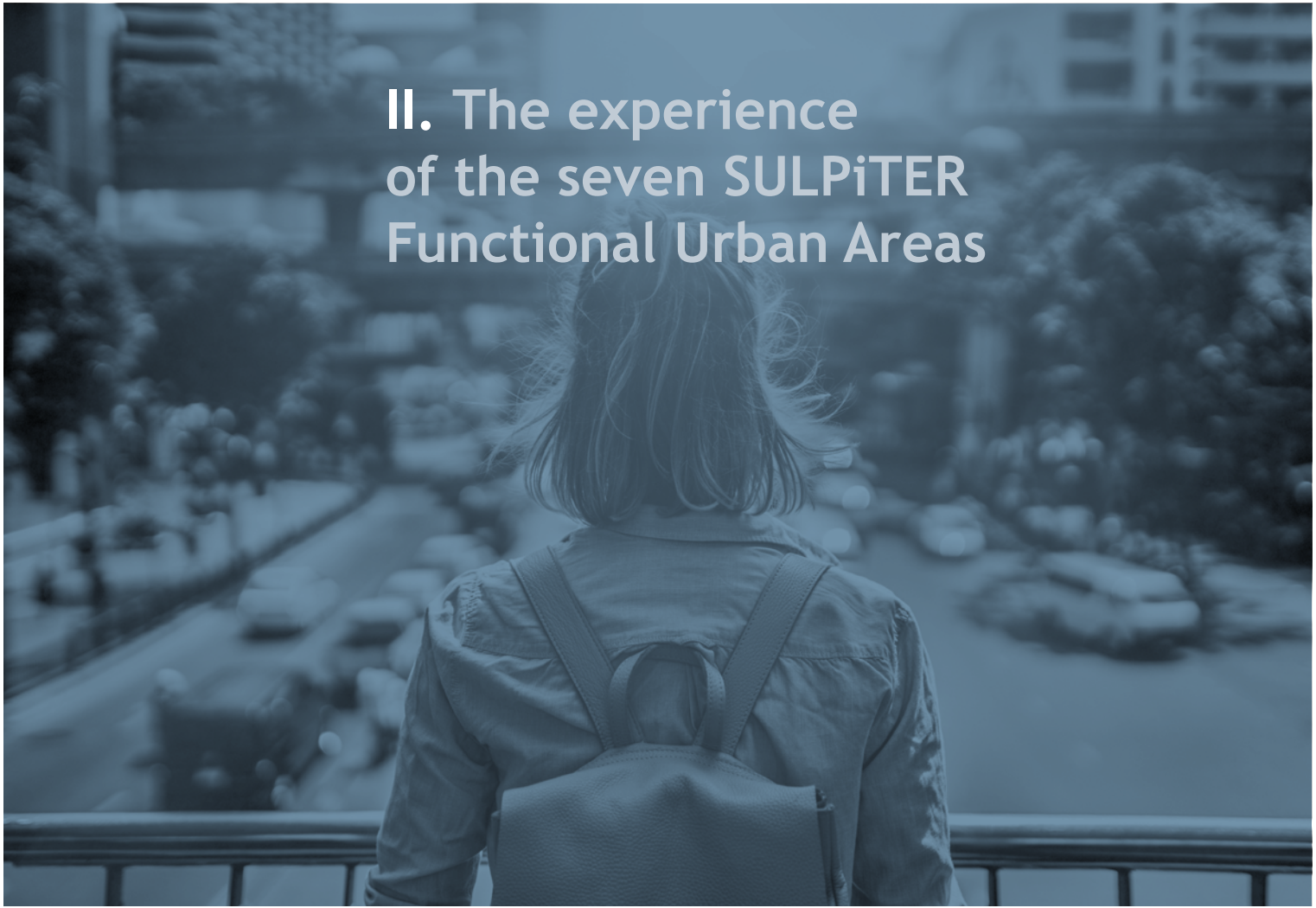

II. The experience of the seven SULPiTER Functional Urban Areas

FUA OF BOLOGNA, METROPOLITAN CITY OF BOLOGNA, ITALY

The SULP and the SUMP of the Metropolitan city of Bologna are designed together as a first experience in Italy dealing with a whole metropolitan area and one of the few in Europe.
The Metropolitan City and the Municipality of Bologna, together with the 7 Municipal Unions which are included in our territory, decided to face as a unique team the issue of sustainable mobility, people and freight.
The vision is grounded on basic principles to improve life in the Metropolitan City of Bologna and make it a more attractive territory thanks to higher levels of urban quality and livability. The aim is to strengthen the cohesion and attractiveness of the territorial system as a whole, as well as Bologna as an international city.
First of all, emphasis is given to the concept of attractiveness, because its meaning is not usually related to mobility matters. However, mobility is key for the capacity of the socioeconomic and territorial system to emerge as competitive in life quality, service standards for people and firms, and tourism services. In this perspective, mobility becomes not the purpose, but the mean to realize the vision of Bologna. At the same time, monitoring activity will allow – in the mid and long term – to measure the results of programmed actions, the benefits achieved and the necessary balancing measures. This will be made possible through an info-mobile information system too.
Thanks to the SULPiTER project, Bologna had the possibility to develop the SULP within the same framework of the SUMP, with an innovative approach design by the ELTIS guidelines.
According to the OECD, 20% of energy consumption for transport is attributable to freight transport, thus the EC has set the ambitious goal of CO_2-free city logistics by 2030. We need to consider the reduction of the pollution by urban freight as a fundamental step to fulfill the EC target.
The added value of SULPiTER is to face the issue of urban freight in the perspective of FUAs, taking into consideration the functional transport and economic relations between inner urban centers (the usual and limited territorial target of public regulations) and the surrounding urban territories, as well as the functional transport and economic relations within FUAs not affecting downtowns. SULPiTER has a mission to support policy makers, as in the case of Bologna, in improving their understanding of FUAs freight phenomena in an environmental perspective, enhancing their capacity in urban freight mobility planning in order to develop and adopt Sustainable Urban Logistics Plans – as we have done in Bologna metropolitan area.
The Sustainable Urban Logistic Plan of the Metropolitan City of Bologna was officially adopted 27th of November 2018 and represents a clear statement of our policies makers for the future energy and environmental sustainability of freight transport.

FUA OF BUDAPEST, DISTRICT 18TH AND CITY OF VECSES, HUNGARY

The comprehensive global changes are creating great opportunities and challenges for improving the sustainable efficiency and competitiveness of Budapest FUA's urban freight transport. Another important added value is the reduction of the city's carbon-footprint.
Currently, there are no logistics concepts or plans pertaining to Budapest FUA that have been officially approved by the central authorities of Budapest. A previously completed urban plan authenticated by decision-makers (the so-called Balázs Mór Terv) was a fundamental prerequisite to solve logistics problems, like traffic congestion (currently +160 000 cars compared to city optimum), the growing numbers of urban trucks (currently +25 000 small trucks compared to city optimum), growing air pollution, increasing noise impact. These problems are not only about reduction of efficiency and productivity of urban freight, but also influence the quality of life of the residents, so they need to be managed with foresight and in a sustainable manner.
The SULP objectives of Budapest FUA are to introduce new and sustainable regulations into the logistics and freight transport system, and to review the so far existed regulation systems. The message of our SULP draws the attention on the fact that there are new concepts in the understanding of urban freight transport, which deserve consideration and will shape a different future of urban logistics.
The operative goals are to create an efficient, incentivizing, uniform freight traffic and transport, entry and city logistics concept for Budapest and its catchment area, considering also environmental aspects.
SULPiTER helped to reduce the logistics risks of Budapest FUA, which apply to traffic preparation, implementation and operation, that could be minimized based on SULP appropriate project management.
The challenges are related to the optimization of logistics systems and the related spatial, functional and technological issues, restructuring of large-scale urban regions. The overall stakeholders' feedback from the participatory process were of particular importance, raising interesting questions and knowledge about city logistics, organization and operations.
Finally, not only the optimization, transformation and organization of a new urban logistics system in Budapest FUA would be the main reason of the required changes, but also the raising of awareness of urban citizens.
The residents of Budapest should also change their transport and consuming habits to contribute to the development of a new sustainable and comprehensive urban logistics system.

FUA OF BRESCIA, ITALY

The City of Brescia and 15 surrounding Municipalities form the Functional Urban Area of Brescia. It covers about 300 km^2 with more than 300 000 inhabitants and 19 000 businesses that generate a large freight flow. SULPiTER gave the opportunity to assess current goods distribution trends using first-hand data, and to work on the mitigation of negative impacts of urban freight flows.

Participating in SULPiTER allowed Brescia Mobilità to implement an accurate analysis of logistics and transport trends in Brescia FUA.

Data collected in this framework provided a clear picture of the freight flows, thus enabling for better planning. Results were shared with public stakeholders and private operators during FQP meetings in which participants contributed to defining objectives and actions to improve the status of transport and logistics in Brescia FUA. The open and holistic approach fostered by SULPiTER was particularly beneficial, since it paved the grounds for participatory development of the SULP.

Implementing the methodology developed by SULPiTER, the discussion initially focused on the identification of main problems (e.g. short term planning of the access to Limited Traffic Zone; freight distribution in the city centre; development of the railway terminal La Piccola Velocità) and further on the definition of specific objectives aiming at reducing congestion and pollution to foster competitiveness and quality of life.

Specifically, Brescia Mobilità together with participants of FQPs set three main objectives:

1. Reduce road congestion by increasing the accessibility of freight transport to the city, thanks to better integration between industrial and commercial areas and freight terminal/redeveloped interchange hubs
2. Improve the competitiveness of the freight transport system in Brescia FUA, through vehicles with higher load factor and greater efficiency in logistics
3. Improvement the quality of life by reducing pollution in Brescia FUA, favouring the transition to a carbon-free logistics. This must necessarily be done gradually but constantly, shifting from polluting vehicles to ZEV

Thanks to the work of the FQPs, nine interventions were proposed as solutions to several problems identified in Brescia FUA. The most important ones concern the intermodal terminal La Piccola Velocità, with infrastructural upgrading and development of innovative services, the use of vehicles with low or zero environmental impact for goods transport, and the planning of gradual access restrictions to the city centre.

FUA OF MARIBOR, SLOVENIA

The Municipality of Maribor recognized the need to address urban mobility issues already two decades ago, but the most important advancement was done in 2015 with the adoption of the Sustainable Urban Mobility Plan. However, in the methodology for development of SUMPs logistics was only partially addressed and therefore SULPiTER project provided the perfect opportunity to overcome this issue.

During the SULPiTER project, the Municipality of Maribor identified several issues related to urban freight (e.g. illegal parking of delivery vehicles, violation of access rules and congestion at peak delivery hours) to be systematically addressed. Lack of urban freight data hindered the creation of efficient policies and measures.

SULPiTER provided a robust methodological approach, and urban freight data were gathered and fed into the SULPiTER analytical tool. This led to the identification of existing and emerging problems in Maribor Municipality and FUA. The Municipality of Maribor could get an insight into several crucial problems, which resulted in the formulation of the following general objectives: raising awareness about freight traffic issues in the region; better integration of logistics into urban mobility planning processes; improvement of efficiency and sustainability of urban freight operations; support to environmentally friendly freight delivery vehicles; improvement of quality of life (liveability); support to local economy.

During the creation of the SULP, the majority of identified issues were addressed with special emphasis on those related to the city centre, where urban freight problems are most evident. Measures defined in SULP are mainly related to management of access restrictions, environmentally friendly delivery solutions, new logistics facilities (e.g. loading bays) and new governance solutions. A comprehensive set of measures (including allocation of financial means and responsibilities) was developed in the form of an action plan. The plan defines specific steps of the municipality towards sustainable urban freight transport in the future.

Finally, the establishment of the FQP was crucial for the success of SULPiTER in Maribor. During the FQP meetings, we gained mutual understanding about everyday logistics problems and potential solutions for improvement of logistics issues, both from an operational but also from a policy-making point of view. We noticed that different stakeholders had somewhat different perception of future logistics needs. We realised that collaboration is crucial for development of effective policies. In Maribor, FQP will act as a permanent communication channel among private stakeholders and policy makers. It will also take the role of an intersectorial coordination for exchange of information and development of future policies and measures.

FUA OF POZNAŃ, POLAND

The City of Poznań got involved in the SULPiTER project because it aimed to improve freight transport planning capabilities in its urban functional areas, to reduce CO_2 emissions and the negative impacts of transport on the environment. Poznań is the fifth largest city in Poland in terms of population and, like many other Polish cities, it suffers from a big pollution problem, especially during wintertime. Air quality improvement in the city can only be achieved by taking measures to reduce the number of vehicles entering the city centre and mitigate their effects. At the same time, delivery vehicles are crucial for the local economy as they cover large distances every day to deliver the order to the customer. Such challenges encouraged the City of Poznań to implement the SULPiTER project, the effects of which are intended to reduce negative emissions.
In addition, thanks to the focus on FUA level, the exchange of experience and good practices was a key success factor in the implementation of the project, as they allowed a more effective implementation of low-carbon transport policy in the future.
The most important benefits in the participation of City of Poznań in SULPiTER were:

- Understanding of the city logistics phenomena within the FUA;
- Improvement of freight transport planning and modelling skills;
- Cooperation between public and private sectors thanks to the Freight Quality Partnership;
- The creation of a Sustainable Urban Logistics Plan as the main strategic document for last mile distribution.

An important milestone of the project implementation was the development of a SULP. Poznań, together with other six FUA, has developed a SULP to be mainstreamed in the SUMP.
During the development of the Sustainable Logistics Plan for Poznań, attention was drawn on the need for a holistic approach to mobility not only of pedestrians, public transport, but also of urban freight transport. A holistic approach was necessary for a comprehensive analysis in the Poznań FUA. The study included conclusions from stakeholder meetings, research results and logistics solutions analysed during the SULPiTER project. There was no similar document in the city of Poznań before. The SULP is the first document which, after its implementation into the SUMP, will allow for a broad outlook and a comprehensive review of Mobility in Poznań.

FUA OF RIJEKA, CROATIA

Rijeka FUA encompasses 5 zones that include the city of Rijeka with surrounding smaller cities (Kastav, Opatija, Lovran and Bakar) and municipalities (Viškovo, Klana, Čavle, Kostrena and Matulji). Although the total area of Rijeka FUA is 625,75 km2 with more than 200 000 inhabitants, the spatially smallest zone, the city of Rijeka is also the most active one. It is located in an area of only 44 km2 and has over 128 000 inhabitants, making it the most densely populated area, not only in Rijeka FUA, but in all Croatia as well. Furthermore, Rijeka is the most commercially active area in the County Primorje – Gorski Kotar, in which it is located, and daily commuting hotspot from other zones of the FUA area. All of this means that Rijeka is facing serious traffic problems: congestion, pollution and poor connectivity within FUA. Within the SULPiTER project, the City of Rijeka was given the opportunity to understand the functional transport and economic relations between its city center and surrounding areas, and to find the possible solutions for the specific problems with freight transport in Rijeka FUA.

The sustainable urban logistic plan in Rijeka FUA, developed during the SULPiTER project, represents the first serious attempt to encompass the situation of freight traffic in Rijeka FUA. Through a comprehensive research and analysis of logistic problems of freight traffic in Rijeka FUA, the City of Rijeka identified several issues that needed to be addressed in the SULP document.

The SULP development process started with the establishment of the FQP in Rijeka, and has marked the first time that private stakeholders were invited to join meetings regarding freight traffic. The information and data collected at the FQP meetings and through interviews with commercial and transport operators were translated into measures that are now implemented in the Rijeka SULP: ensure good traffic connection of the Functional Region of Northern Adriatic with TENT transport network (all types of traffic); improve transport accessibility and availability (international, national, regional, micro-regional) of the entire area of functional region of all traffic branches, taking into account the principles of development of efficient, optimal and sustainable transport system; reduce the traffic of motor vehicles in urban areas to reduce environmental impact; introduce vehicles of low or zero gas emissions in the logistics delivery system of Rijeka; introduce IT solutions for the control and management of the delivery system in the city and harmonize supply regulations adopted by the City of Rijeka with specific objectives and measures proposed in SULP.

FUA OF STUTTGART, GERMANY

Wirtschaftsförderung Region Stuttgart

The Stuttgart Region can pride itself with a very successful industry. Actually, the region is one of the few areas in Europe in which industry is a main contributor to regional income. Also, we experience strong flows of in-migration and an increase in population. As a result, we have serious land use and traffic problems on all levels, and these problems are increasing. We also face air pollution and noise problems, for which we must find sustainable solutions in order to ensure the necessary mobility of people and goods.

Recently, a new regional traffic and transport plan was finalized, dealing with passenger traffic. However, many of our traffic- related problems are caused by goods transport as well.

Goods transport in Stuttgart Region has many aspects. With other regions, we share the need to serve trade, retail and households. With e-commerce, the goods flows to private households is increasing a lot, and so are the return flows from private households to retailers. Our strong industry results in exceptionally strong goods flows in import and export, as well as flows between manufacturers. Almost any product is manufactured in stages, at different factories, and this results in the flows between the factories being a most significant part of all goods flows within the region.

Furthermore, we have specific problems with our very hilly topography. Not only does this result in a lack of space, but it also means that traffic runs along very few axes, putting hard burdens on individual settlements and municipalities.

Therefore, the Stuttgart Region has followed the work of SULPiTER with great interest. We learned about goods transport in a typical 2nd level downtown area (i.e. inner Bad Cannstatt), something about which we had not had any systematic knowledge before. We had the chance to debate several issues within the meetings of the FQP. FQPs featured a very pragmatic approach and we aim to continue operating them in future.

We developed a Sustainable Urban Logistics Plan for Stuttgart Region. Currently, the plan is a document to be used by regional planners and local planners alike. It will help to move the focus away from just looking at parcel deliveries in pedestrian areas; the focus will be on taking into account the relevant goods flows within and through Stuttgart Region. Since the regional traffic and transport plan was just recently adopted via the regional parliament and after an intensive public debate, the SULP will be used a supplement and reference to the traffic and transport plan.

III. The SULPiTER methodology for understanding urban freight behaviours.

The need for urban freight data analysis

Before the 1980s, public authorities did not manage urban freight flows because road congestion and air pollution were not recognized as problems requiring interventions[2]. Policies with regard to freight transportation and logistics were mainly dealing with specific measures on exceptional situations (emergencies etc.). With increase of urban traffic and escalating congestion, not only in large but also in medium cities, majority of public administrations were affronted with problems of urban freight distribution, that were up until that point traditionally managed only by the transportation carriers[3 4].

Between the 1990s and the beginning of the twenty-first century, with the backing of public administrations and other support funds, several studies and pilot tests have been carried out to understand how to organise urban freight distribution in order to decrease traffic and pollution deriving from this transportation sector. Most of these studies were oriented to support public authorities in decisions related to urban freight transportation planning[5]. These studies resulted in increasing number of restrictive measures for urban freight deliveries (e.g. Low Emission Zones, Time Windows, Vehicle Weight and/or Size Restrictions, Congestion charging) with the main aim of mitigating negative impact of freight transport in urban areas[6]. Despite huge efforts of all those projects and specific pilot cases, urban freight transport problems still exist.

One possible reason for this inefficiency is lack of urban freight data and consequently deficient understanding of the magnitude of urban logistics issues[7]. Comprehensive tools for systematic gathering and interpretation of urban freight data is missing from the policy and operational point of view[8]. The other possible reason is in the existing approach of measures, which are only partial and mainly related specifically to the city centres and/or to the last mile of classical supply chains[9]. In order to understand possibilities for mitigating urban freight flows and to solve the problem holistically, we would need to tackle urban freight on the level of the entire supply chain (including enterprises' strategies) and from the perspective of the FUA.

To overcome these problems SULPiTER has developed an analytical tool for comprehensive analysis of urban freight data to provide a basis for understanding urban freight phenomena from quantitative and qualitative point of view. In addition, the project also developed a methodology for the identification of trends and scenarios of logistics development that will have and important impact on Central Europe urban areas in the future.

The SULPiTER analytical tool

The SULPiTER project designed and developed an analytical tool for estimating freight demand deriving from economic activities and has implemented it on the FUA context. The tool is to be used as a decision support system for policy makers to facilitate the process of elaboration of alternative city logistics scenarios. The tool consists of a three-step process:

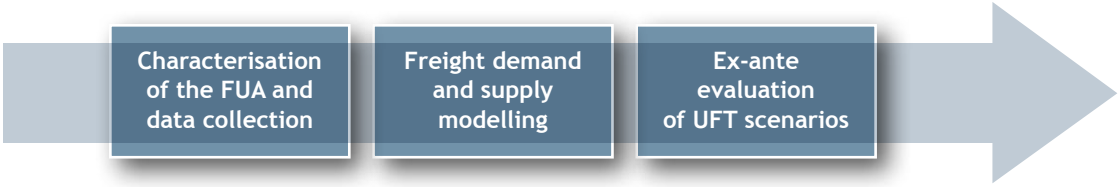

Figure 1: three-step procedure of the SULPiTER tool

STEP1: The first step concerns the definition of the FUA and the data collection to characterize the FUA and collect all information of 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, infra-structures). This phase is made up of four blocks of activities:

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

Within this step, many types of data have to be gathered with on-field surveys and interviews as well as from existing data sources (statistical information, traffic counters etc).

STEP 2: The second step involves specific transport model 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 model 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)

STEP3: The third step consists of the ex-ante assessment of Urban Freight Transport scenarios and involves the calculation of the Logistics Sustainability Index (LSI) 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 the following block of activities:

- Identification and selection of stakeholder's 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 criterion 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);

The final activity includes a calculation of a "BEFORE" and "AFTER" scenario for particular set of measures and evaluation of their impact on before mentioned areas. This helps to understand the possibilities for improvement in case of measures implementation.

Understanding logistics trends and scenarios – vision for the future

Freight transport in FUAs is expected to develop along global logistics trends having important impact on the Central Europe logistics efficiency. To understand these impacts SULPiTER developed a methodology composed of a two-step process.

STEP 1: In the first step a literature review is done to identify and summarize the main trends. Analysis contains a summary of trends originating from strategic/political documents, industry driven initiatives, scientific articles and research papers. Trends and initiatives identified through deskwork analysis range from very general/global trends towards specific initiatives relevant for particular supply chains. Only those trends that might have direct or indirect influence on regional freight transport flows are captured.

STEP 2: The second step is based on the Delphi methodology, which is a structured technique, originally developed as a systematic, interactive forecasting and policy-making methodology and relies on a panel of experts. The methodology requires to select relevant topics, identify survey questions, select experts (business sector, authorities, research and other), gather their opinions and analyse the result. The Delphi methodology requires to answer a questionnaire in at least two rounds. In SULPiTER methodology the second round was done in the form of an Experts' workshop. The selection of relevant areas and topics was developed based on the literature review resulting with the identification of nine topics (demographic trends, trends in consumer behaviour, government side, industry side, world production and trade, new business models and supply chain management, clean fuel, ITS, frontier technologies) belonging to the following four core areas: consumption; land and road use; distribution and supply chain management and technologies and equipment.

For each topic, one or more drivers of urban logistics have been selected, in the shape of trends occurring/developing or factors having an impact on urban logistics.

Number of questions have been developed and included in the Expert Survey, relating to the 13 selected drivers (grey power logistics, environment and sustainability, e-commerce, sharing economy, public planning, industry planning, globalization trends, desire for speed, omni-channel logistics, CNG and EV for urban freight, IOT and

big data, unmanned aerial vehicles, automated vehicles). The 13 drivers were presented to the experts in terms of trends occurring/developing and factors influencing urban logistics. Each trend was depicted in a short paragraph to provide context to the questions.
For each driver, the Expert has been asked to:

- specify its impact on urban logistics, on a qualitative scale from 1 to 5 (1 meaning very low impact / influence / diffusion / probability, while 5 meaning very high);
- choose a time frame in which it is likely to occur / have influence on urban logistics, choosing between four options: 'Before 2020', 'Before 2030', 'After 2030', and 'Never'.

Finally, the results of the survey have been analysed in detail and discussed at the panel of selected experts to evaluate validate influence of particular trends on CE logistics efficiency.

The engagement of local stakeholders.
Why engaging stakeholders in the urban freight transport?

One of the key-factors for implementing sustainable policies in the urban freight transport is the stakeholder cooperation[10] [11]. In the last decades, urban freight transport has been identified as a business problem, that more or less is solving itself[12] [13]. However, perspective has recently changed, from a situation wherein logistics is a business problem handled by private parties, to a "more public logistics", with stronger involvement by public organizations.
This concept has been recently stressed again by the European Commission in the scope of a comprehensive Study on Urban Logistics[14]. Logistics activities depend on the interaction between many stakeholders, often with unique characteristics, strategies, business models, objectives or roles. Local authorities attempt to mitigate the external challenges presented by urban freight logistics such as emissions, congestion or accidents; while working to create conditions that will promote the efficiency of operations and processes. The scope of intervention of (local) authorities is, however, limited. Logistics activities are essentially of a private nature and EU regulation sets clear limits to the lawful level of

influence of public authorities. Secondly, when urban freight logistics is the end part, or last mile, of either longer supply chains or larger distribution networks, stakeholders must measure the impact of the (local) policy measures on their chains and networks. The actual impact of the measures may be lower than initially expected.
The most common tool for Public Authorities for including stakeholders in the decision-making process is the FQP : partnerships between local authorities, local community, freight industry, private sector, environmental groups and other stakeholders. Their goal is to develop an agreement related to freight transport issues.
These tools promote the adoption of best practices with the purpose to obtain an economic, safe, efficient and sustainable freight transport. This topic is very complex and heterogeneous since it involves different goals, time-scales, structures, operating procedures and subjects. Therefore, it is important to create a forum where stakeholders can interact with each other to reach an agreement about a given question.
Different types of FQPs are possible, depending on forms, objectives, territorial extension, type and number of stakeholders involved, modes of transport considered, amount of funding and other specific issues. FQPs were introduced in the UK in the mid-90's by the Freight Transport Association (FTA) as a tool for bringing together the interested stakeholders in order to:

- identify problems perceived by each interest group regarding the movement and delivery of goods,
- identify measures to solve such problems,
- identify best practice measures and principles for action by local authorities and industry to promote eco-friendly, economic and efficient delivery of merchandise.

The FQP implementation

With the purpose of sharing knowledge and decisions among different stakeholders involved in urban transport policies, SULPiTER has dealt with all the related issues with the ultimate goal of providing clear and easy to use tools for the implementation of SULP. Among the various activities, a specific part of the work was focused on the FQP tool.
In the framework of the project, a detailed analysis of available information has been carried out. It has considered the large spectrum of data sources, both institutional-academic and empirical, arising from real experiences in the field. The research has identified several "success cases" that have led to develop and implement practical measures in the involved territories[16]. This extensive review allowed to identify a few effective steps for a fruitful implementation of a SULPiTER FQP tool. Besides the natural need to tailor each experience to the specific context, it has been possible to identify some common features and implementation stages. These have been outlined in 6 steps that could be used as a checklist for typical implementations.

STEP 1 – STRATEGY DESIGN

The goal is to set up strategic priorities for stakeholders' engagement within the scope of the specific SULP. This stage is crucial to ensuring the identification of issues and stakeholders, within three main areas: Strategic, Thematic, and Territorial.

STEP 2 – SETTING UP THE FQP OBJECTIVES & REQUIREMENTS

This step aims at the identification of Freight Quality Partnership goals within the SULP, i.e. the most important objectives that the FQP has to achieve and which benefits are expected.
Starting from the identification of FQP goals within the SULP, the purpose is to identify which are the stakeholders' categories that have to be involved for a good FQP. Participation can be measured on a continuous scale, ranging from a low level to a high level of stakeholders' participation.

STEP 3 – MAPPING

The goal is to ensure that, as far as possible, all relevant stakeholders are identified, and the output of this step is a list (table / database) indicating: Name of the stakeholder, Contacts, Stakeholder's category, Relation between the stakeholder and the SULP decision making process (i.e. stakeholders with legal, finan-

cial or operational responsibilities in the city logistics issues, stakeholders just affected by the SULP measures, etc.). Furthermore, a qualitative description of each stakeholder (i.e. preliminary pieces of information useful to define the role of the stakeholder in its supply chain, etc.) is needed. Interests / goals / expectations of the stakeholders should be identified.

RECEIVERS OF LOGISTICS SERVICES

> Retail / trade
Small shops, single sourcing business, chain stores

> Industry
Small businesses, larger enterprises, branches

> Gastronomy
Individual enterprises, chain/franchise enterprises

> Large institutions
Hospitals, administration, university

SUPPLIERS OF LOGISTICS SERVICES

> Craftsmen
Serving stores, construction sites, households

> Logistics operators
Truckload,
LCL (less-than-carload)

> Courier, Express, Parcel
Serving businesses and households

ASSOCIATIONS

> Craftsmen
Chamber, business associations

> Logistics operators
Forwarder association, logistics association, trucker association

> Trade
Chamber, retail associations, business club

STEP 4 – PRIORITIZING

Once the stakeholders have been identified, it is crucial to reach the most relevant stakeholders to involve. Engaging all stakeholders in all issues is neither possible nor desirable. Therefore, it is necessary to prioritize stakeholders and issues to ensure that time, resources and expectations are well managed. The aim of this step is to produce a short list of 20 private stakeholders. The criteria to select them are basically based on three issues:

- Influence within the SULP decision- making process;
- Relation with the SULP decision-making process;
- Willingness and ability of stakeholders to engage.

STEP 5 – ENGAGING

This step consists in planning and effectively carrying out engagement activities with the selected stakeholders. Once the stakeholders have been identified with respect to "why, which and for what" they should be engaged, it is crucial to finalize the approach to ensure their full participation. FQP with public authorities should be the first (5a), followed by the FQP with the private stakeholders (5b). They must be considered as two separated bodies running alongside. Nevertheless, overlapping and joint work is possible according to the Organization's strategy.

STEP 6 – ENSTABLISHMENT OF THE FREIGHT QUALITY PARTNERSHIP

After having engaged one-to-one the stakeholders and having collected all the necessary inputs for the work of the Freight Quality Partnership, the FQP starts to meet regularly, through the organization of workshops. The program of the meetings must be arranged according to the overall strategy and linked to the expected contribution of the FQP within the decision-making process of the Plan. In general, the agenda of the first meetings should focus on:

1. Informing the FQP members about the overall process of the Plan and the expected role of the participants;

2. Providing updated data on the current state of the urban freight transport with the goal of building a joint vision of the current state of the city logistics and to support the work of the FQP with reliable data;

3. Training the participants with some "best practices", also at the European level, to broaden the participants' perspective by benchmarking the local case to the European level and to support the work of the board with a set of measures as a starting point for the discussion;

4. Discussing the current issues of the city logistics and possible solutions

Depending to the level of participation, some further meeting should be dedicated to the co-design of the Plan's measures, to the definition of the road map for their implementation, to the criteria for the monitoring.

THE SULPITER METHODOLOGY FOR ENGAGING

1. WHY THIS TOOL?
New organizational approaches

In the past ten years it has become clear that achieving greater efficiency (regarding all aspects of sustainability: social, economic and environmental) in urban freight requires the city/local authority to address the issue with new organizational approaches, which cannot be achieved without public-private understanding, collaboration and partnership (Crainic et al., 2004).
However, identification of the actors and stakeholders as well as their complex relationships and effect on urban freight is not always easy (Ballantyne andand Lindholm, 2012). Hence, there is a large amount of work to carry out before the formation of a partnership.
The SULPiTER methodology for Stakeholders' engagement targets both the SULPiTER partner authorities and further CE FUA policy makers. It is a means to approach and engage business stakeholders in policy making processes and coordinate different territorial levels of authorities in FUAs.

2. HOW DOES IT WORK?
Manual for engaging stakeholders in the UFT: the Freight Quality Partnership

STEP 1: STRATEGY DESIGN

PRINCIPLES, QUESTIONS AND METHOD

This stage is crucial to ensuring the identification of material issues and stakeholders, within three main scopes:

Strategic scope

Have you identified which issues appear to be most important for long-term success and sustainability of your Sustainable Urban Logistics Plan (SULP) of your FUA? Which are their main objectives?

Thematic scope

Have you identified which supply chains will be targeted?

Territorial scope

Have you identified which parts of your FUA will be interested by the SULP?

OUTPUT

List of priorities for stakeholder engagement

STEP 2: SET UP THE FQP'S OBJECTIVES

PRINCIPLES, QUESTIONS AND METHOD

Within the SULP's decision making process, which are the most important objectives that the Freight Quality Partnership (FQP) will help us to achieve?
What benefits I am expecting from the FQP?
What are our external drivers for stakeholder engagement? What are the risks of not engaging?
Starting from the Identification of FQP' goals within the SULP, which are the stakeholder's categories that I have to cover for a good FQP?
How many stakeholders are feasible to manage in my FQP typology?

OUTPUT

Consolidated concept of each Freight Quality Partnership

STEP 3: MAPPING THE STAKEHOLDERS

PRINCIPLES, QUESTIONS AND METHOD

This stage is internal to the Organization or by auditing some key actors which have a wide and consolidated look at the city logistics market (i.e. local trade association, etc.).
The aim is to get a list (table / database) indicating:
Name of the stakeholder,
Contacts (also getting the relevant person to contact),
Stakeholder's category, Relation between the stakeholder and the SULP's decision making process
Qualitative description of the stakeholder (i.e. preliminarily pieces of information to feature the role of the stakeholder in its supply chain, etc.).

OUTPUT

List (table / database) of stakeholders

STAKEHOLDERS IN THE DEFINITION OF SULPS

STEP 4: PRIORITAZING THE STAKEHOLDERS

PRINCIPLES, QUESTIONS AND METHOD

Engaging with all stakeholders or on all issues is neither possible nor desirable. Therefore, you should try and prioritize your stakeholders and issues to ensure that time, resources and expectations are well managed.
The aim is to reach a short list of 20 private stakeholders.
The criteria to select them are basically based on three issue:
Influence within the SULP's decision making process;
Dependency to the SULP's decision making process;
The willingness and ability of stakeholders to engage.

OUTPUT

Short-List (table / database) of stakeholders

STEP 5a: ENGAGE THE STAKEHOLDERS (Authorities)

PRINCIPLES, QUESTIONS AND METHOD

This phase will stress the different authorities related to the city logistics issues under a two dimensional prospective:
Horizontal, SULP definition is a intra-sectorial competence, so different departments within the same Authority will be involved (Local police, Planning department, Environment department, Transport department, Trade department, Urban development department)
Vertical, i.e. territorial authorities within the same FUA (Region, Metropolitan city, Municipalities, Districts).

OUTPUT

One to one contact and interview with Authority

STEP 5b: ENGAGE THE STAKEHOLDERS (Privates)

PRINCIPLES, QUESTIONS AND METHOD

The private stakeholders are engaged via face-to-face visits (meetings or calls). Through a questionnaire, the Organization will feature in detail stakeholder's basic information, behaviours, problems & needs related to the city logistics.

OUTPUT

GETTIN STARTED. Short introduction of yourself and your institution. Explain the reason of your visit, keep it simple: We need your expertise. We want to train the city administration regarding the needs of logistics in a conurbation. The city is interested in synergies from cooperation. Your recommendations are sought for.
CONTENT QUESTIONS. What kind of logistics activities does your business deal with? Can you quantify? Which are the main problems you experience? Technical problems? Organizational problems? Specific problems with traffic and space? Can any of these be handled in cooperation with city/region/other actors? Can you suggest any solutions?
ENGAGEMENT QUESTIONS. Would you present your ideas and standpoints personally? Would you take part in a regular round table with stakeholders? The Round Table would debate your topics and interests, looking for solutions. This is a first step towards a so-called "Freight Quality Partnership". Can you recommend further potential participants?

STEP 6: ENSTAB. OF FREIGHT QUALITY PARTNERSHIP

Long-term partnership between urban freight stakeholders that, on formal or informal basis, meet regularly to discuss (and sometimes find solutions to) problems and issues that occur in the urban area.

After having engaged one-to-one the stakeholders and having collected all the necessary inputs for the work of the Freight Quality Partnership, the FQP starts to meet regularly, through the organization of workshops. The program of the meetings must be arranged according to the overall strategy and linked to the expected contribution of the FQP within the decision-making process of the Plan.

IV. The Sustainable Urban Logistics Plan in each Functional Urban Area

BOLOGNA

The SULP of the Metropolitan City of Bologna is characterized by the participation of the stakeholders at all levels. In fact, the participation began with the activity of data collection that represented the opportunity to start the interaction with respondents and particularly the commercial activities, industrial activities and transport operators.
These three categories have had the opportunity to share what are the (perceived) critical issues concerning the use of loading/unloading operations, the criticalities related to the use of the railway carrier (only for industrial activities) and in general the problems encountered in the delivery of goods. The point of view of those involved in last mile deliveries is extremely important, because it made possible to improve the understanding of the operations and therefore the technical proposals.
Concerning the possibility to activate new railway services, meetings were held with the railway infrastructure manager (RFI) in order to share the idea of creating a multi-modal goods distribution system. RFI suggested an internal area of San Donato terminal, where the transshipment activity with road vehicle could be carried out.
This idea was also shared both with the Bologna Freight Village (which would be the hub of the shuttle service) and with the logistics and railway operators, which in addition to considering it an interesting (possible) business opportunity, believe that the Freight Village must develop specialized and innovative services in order to compete in a highly competitive world.
In any case, a permanent FQP is one of the actions included in the SULP. The main elements of the FQP are the following:

- A permanent group equipped with tools for monitoring, guidance and expert support;
- The Metropolitan city of Bologna chairs the FQP and provides technical expertise;
  scientific expertise by the university and consultation provided by representatives of sector operators;
- Working program in compliance with the actions of the SULP (to assess and propose logistics projects
  to foster sustainability, intermodality, and so on);
- It plays the role of «logistics developer»;
- Ensures relationship with municipalities involved in private logistics initiatives;
- Ensures relationship with leading supply chain operators in the FUA, e.g. RFI, Interporto di Bologna,
  Bologna Airport, forwarders (DHL, DB Schenker), Mercitalia Rail.

Fig 1. Some moments of the FQP meetings

The applied strategy of the stakeholder involvement is synthesized in figure below, where the sub-activities and the periods of the meetings are depicted.

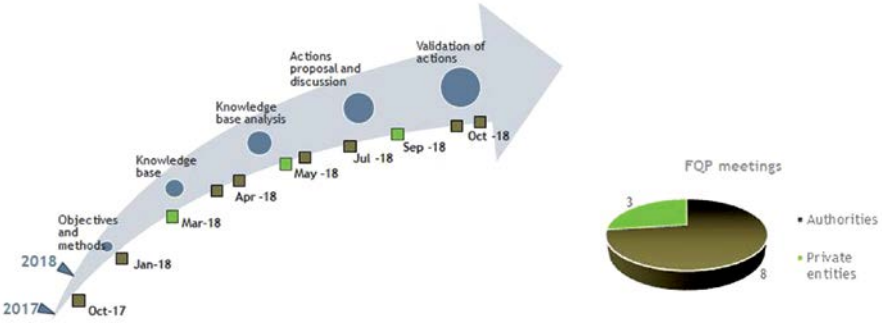

Fig 2. FQP involvement strategy: sub-activities and periods of the meetings

The SULP of the Metropolitan City of Bologna foresees several actions capable of responding on the one hand to the needs and demands of freight transport, maintaining a high levels of service, and on the other hand to reduce, progressively, CO_2 emissions and other negative externalities, while sustainable development.
These aspects are strongly important in urban area, because in these contexts the transport activities are more difficult due to the density of the population and services concentrated on relatively small areas. For these reasons the SULP envisions freight transport and logistics in a system with other transport modes and with the population, to find the solution that maximizes the benefits of the whole system.
The SULP of Metropolitan City of Bologna must also be coherent with the good practices already implemented in the area, such as the Regional Integrated Air Plan (PAIR2020) and "Mi muovo Elettrico" (a regional plan), both encouraging sustainable mobility with actions aimed at encouraging the use of electric or eco-friendly vehicles. Sustainable Urban Logistic Plan vision, in fact, is coherent with the objectives established by PAIR. Such objectives with regards to freight transport are:

- Incentive and promotion of electric vehicles;
- Enhancement of electric charging points;
- Incentive of renovation of the vehicles and limitation of the access to city centers for the most polluting vehicles;
- Management of freight transport in the last mile and in the LTZ;
- Promoting sustainability and optimizing short-range logistics;
- Promoting sustainability and optimization of logistics cluster:
- Modal shift from road to rail.

In line with the objectives above, we have identified the following four objectives that can summarize the vision off he SULP:

- Contribute to climate protection by reducing the greenhouse gas emissions of the entire Metropolitan area with the exception of the city centers where the direct CO_2 emissions must be eliminate by 2030
- Reduction of the contribution to road congestion through the optimization of the delivery and the adoption of new schemes. This objective refers to the all uses using the road infrastructures, including the parking areas, which are shared space with the other components of road traffic (private and collective)
- Reduction of logistic sprawl through the establishment of new logistics/productive enterprises in logistics clusters where the companies could be located if they will reach specific environmental and social performance
- Development of the logistics market. To achieve a logistic system able to follow the demand and the increasing requests of the market, while ensuring a high levels of service

The actions proposed by SULP refer to three time horizons. i.e. 2020, 2025 and 2030. Generally speaking, the proposed actions require technical times that do not allow them to be activated by 2020 ,but all actions will be fully operational by 2030. This is also explained in the figure below.

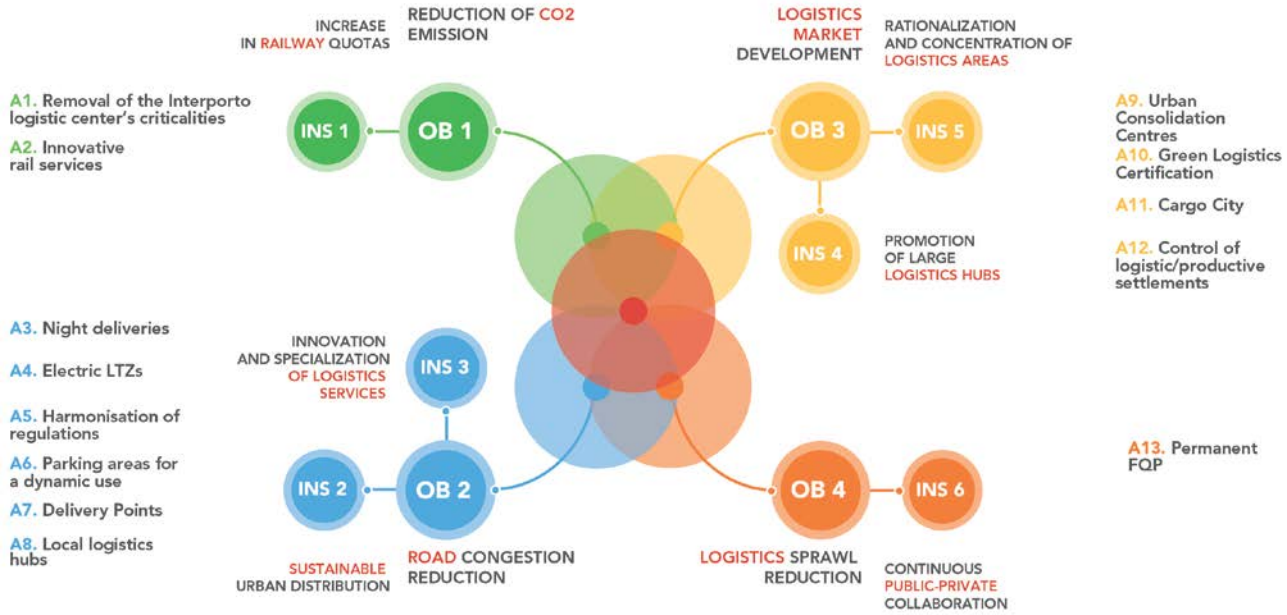

Fig. 3. SULP of the Metropolitan City of Bologna

Fig. 4. Objectives, strategies and action of the SULP of the Metropolitan City of Bologna

The SULP Development of Budapest FUA

Within the Budapest Metropolitan Area, two municipalities were partners in the SULPiTER project. One of them is one of the 23 districts of the City, the Municipality of the District 18 (Pestszentlőrinc and Pestszentimre) and the other one is the Municipality of the City of Vecsés, which is a neighboring settlement of the 18. district, lying just outside the administrative border of Budapest. The 18th district and Vecsés are strongly connected, mainly because the Budapest Ferenc Liszt International Airport is located partly on the area of the district and partly on the area of Vecsés. The Municipality of Budapest was not a partner in the project, but since the logistics system had to be handled on FUA level, the SULP document was elaborated with a focus on the whole city of Budapest with an outlook on its agglomeration and a bigger emphasis on the 18th district and Vecsés.

We first examined the state of play of freight transport, examining the current policies of logistics and transport, the status of freight transport in Budapest, the results of a survey made in Budapest and Vecsés in 381 retailer, wholesaler and HoReCa units and traffic counts. This analysis allowed us to identify the main problems faced by the Budapest FUA in the area of urban logistics. We categorised problems into four groups, which covered the area of the legal framework and regulation, the organisational directions of logistics, as well as issues related to build infrastructure and rolling stock. Overall, the problems were linked to negatively impact air-quality and dynamics of traffic organisation, but in many cases the efficiency of logistics, transportation and loading as well.

The survey contained questions concerning the unit‘s warehouses, vehicle fleet, suppliers, the delivery process and also some questions on the problems and suggestions they have in the area of logistics. Most of the units who were interviewed belonged to the categories of “Restaurants, bar, café, pastry”, “Food & beverage” and “Clothing and shoes retail”. From all of the supplies done in these units about 2/3 is done by delivery Duty Paid and only around a third is done by Ex Works. When asking about the problems and suggestions, around 30% claimed all is well. The most important issues mentioned by the others were the accessibility problems of the loading points (either physically or legally), the timing of the supplies or the process of the goods reception.

Based on the analysis done, we identified a system of objectives. At the highest level, we defined a comprehensive goal, which presents the solution for the entire problem-set, and then broke this down into strategic and operative goals. The strategic goals set out the key tasks related to the various problem areas, while the operative goals focus on the more specific, but still generalised objective of the given problems.

The comprehensive goal is enhancing the efficiency of logistics and freight transport processes, reducing the rate of environmental load. It is supported by the following strategic objectives:

1. Introducing new regulations into the logistics and freight transport system, and reviewing existing regulations
2. Efficient management of urban freight transport
3. Infrastructure-side support for logistics, freight transport and loading processes
4. Incentivizing the use of environmentally-friendly and innovative technologies and vehicles

A few operational goals and a range of measures support every strategic goal. Altogether 19 measures were set up:

- In the area of the first strategic goal (regulations), the measures mostly aim to create an integrative, coherent regulatory system, which effectively connects the different administrative levels and supported by a logistics concept for the FUA of Budapest.
- On the area of the second strategic goal (efficient management), the measures mainly aim the creation of an organization which is capable of coordinating the logistics issues of the city comprehensively, do the controlling tasks efficiently and also promote environmentally friendly directions in the development of the logistics system.
- The third strategic goal (the development of the infrastructure) is supported by measures that aim to develop the system of loading points, consolidation centres, but also give support by an IT background and innovative solutions.
- The measures supporting the fourth strategic goal (to incentive the use of environmentally-friendly and innovative technologies and vehicles) are for example the introduction of the Qualified Budapest Freight Transport System, positive incentives, charging infrastructure, the support for alternative methods in last mile freight transport…etc.

Role of the stakeholder's involvement

As part of the project, there were regular consultations with stakeholders, which focused on the current situation and future of urban logistics. These consultations were conducted within the framework of the FQP, whose goal is to join and coordinate various local and national players involved in logistics and urban freight transportation, as well as opinion-shaping and increasing receptiveness to the topic. There have been five meetings, where regulatory, retail, planning, supplier or other stakeholders sat down and conducted successful negotiations on various freight transportation and city logistics topics. The meetings and their results played an important role in the preparation of the SULP document, the participants provided opinions, enriched the document under preparation with their comments and observations, and validated its content. The FQP has stimulated problem-solving approaches, establishing more effective interest representation.

Brescia FUA SULP And Other Policies

The SULP of Brescia FUA is a planning document for a super-municipal area that defines the actions Brescia Municipality should undertake in the sector of city logistics within 2030, a year the European Commission defined as the objective of "Urban distribution of carbon-free goods", namely zero direct emissions of carbon dioxide (CO_2).
It builds on existing policies and planning documents dealing with transport and logistics mainly divided into three types: 1) Guidelines; 2) Spatial planning documents; 3) Strategic documents.

Challenges in Brescia Fua related to goods transport and logistics

From the freight flow analysis and direct interview with operators, several problems came out:
1. The lack in loading and unloading cargo bays planning, especially in LTZ (city centre).
2. The regulation for the LTZ access is too rigid: time slots are too narrow, access and parking costs too high. Shops/ commercial activities' logistics needs are not taken enough into consideration/ planning.
3. The shopkeepers' business model is characterized by low or total absence of stocks, and have a continuous supplying process to match the customers' requests.

Specific objectives of Brescia FUA SULP

- Specific objective 1 - Reduce road congestion by increasing the accessibility of the freight transport to the city, through a better integration between industrial and commercial areas and freight terminal/ redeveloped interchange points.
- Specific objective 2 - Improve the competitiveness of the freight transport system in Brescia FUA, with a higher load factor of freight vehicles and a greater efficiency in logistics.
- Specific objective 3 - Improve the citizens' quality of life by reducing pollution in Brescia FUA, favouring a gradual transition from polluting to reduced (or zero) environmental impacts vehicles used in the goods delivery in the city centre.

Measures

Measure 1: The intermodal terminal "La Piccola Velocità"

The new terminal "La Piccola Velocità" represents an important opportunity for Brescia FUA as far as railway traffic growth is regarded, expected in the next decade in the north-west Italy, thanks to the increase of infrastructure capacity along the Alpine railway and the completion of the high-speed / high capacity Milan-Verona-Venice line. The shift from roads to railways is a strategic choice for the future of Brescia as a node connected to the main freight routes, in order to ensure the competitiveness of local industry in European and global context.

Expected benefits: The infrastructural enhancement and development of innovative services of the terminal La Piccola Velocità will mainly aim at:

- Development of the intermodal terminal with positive economic impacts for the whole FUA
- Regulation of expected increase in freight traffic flows with a neutral impact on traffic congestion and a substantial reduction in pollutant emissions.

Measure 2: Freight routes

For the first phase of the terminal development, which foresees infrastructural upgrading of the railway network connected to the terminal, specific routes for goods delivery should be identified. This measure could be a part of the traffic regulation action limiting the conflicts between freight transport and people mobility, and should be applied in the area connecting the terminal to fruit and vegetable market (southwest of FUA's first urban belt) and to the city centre and the entrance of highway and beltway.

Expected benefits: The purpose of the measure is to avoid conflicts between users of goods transport and people's private mobility; in addition, the average speed is expected to increase for both categories (passengers' mobility and freight transport) and the emissions are expected to decrease due to lower congestion. Furthermore, this type of measure favours road safety, helping transport operators to reach their destinations more easily.

Measure 3: Spatial planning for logistics

The type of measure focuses on identifying and "booking" spaces/ areas for logistic purposes. It may concern the conversion of specific areas for logistics purposes with changes in the use destinations. The goal is to increase the efficiency of freight transport in the territorial context of reference.

Expected benefits: A strategic allocation of logistics areas should improve logistics efficiency. At the same time, a rational and systematic choice of logistics areas allows to develop scale economies in logistics activities, avoiding the so-called "logistics sprawl" and allowing the concentration of goods handling/ movement inside the intermodal terminal. This way, economies of scale are obtained and the fragmentation of logistic settlements on the territory of the functional urban area are reduced.

Measure 4: Use of vehicles with low (or zero) environmental impact for goods transport

In order to gradually shift the methods of goods delivery inside urban areas towards an increasingly agile and less/zero polluting vehicles, supporting measures have to be implemented, starting with a consolidation centre (already present at Brescia Mercati Consortium) or micro-consolidation centres (for example Proximity Logistics Areas close to historic centre), and a gradual introduction of increasingly stringent constraints that gradually prohibit the access to the city of polluting vehicles used for goods delivery. The types of vehicles that can be used are constantly evolving, but can be summarized mainly in: Bicycles ; Cargo bikes ; Cargo tricycles; Cargo quadricycles.

Expected benefits: Reduction of polluting emissions is the main advantage of this measure. Clearly, the benefits in the increase of e-vehicles share generates further advantage compared to other type of vehicles (e.g. methane), and ensures the substantial reduction of noise pollution. Furthermore, the measures related to subsidies for the purchase of non-polluting vehicles have the advantage of increasing the spread of green transport among freight transport operators.

Measure 5: Goods delivery points

This measure was of particular interest to many of trade association representatives that took part in the FQP process. Solutions such as locker boxes (latest-generation automatic dispensers always open, which allow goods/ documents collection and delivery 24 hours a day) distributed in different areas of the city have been spreading with private e-commerce, where customer is autonomous for the final withdrawal.

Expected benefits: The expected benefits in the implementation of this measure can be summarized mainly in the reduction of distances for commercial vehicles and in a reduction of delivery time. Moreover, if the delivery points are strategically positioned on the major routes, without substantial changes along the routes of operators and traders, the reduction of polluting emissions will certainly be guaranteed.

Measure 6: Identification of Proximity Logistics Spaces (PLS)

Currently a service called Eco-Logis is running in Brescia city and it delivers goods in historic centre using methane or electric vehicles. However, a system of last mile deliveries with cargo bikes or trolleys handled on foot, still lacks. If the area of Brescia fruit and vegetable market, where the Eco-Logis service is currently located, is considered too far from the historic centre for cargo bikes delivery, a low impact/ ad hoc solution (both economic and infrastructural) for the city centre could be the implementation of one (or more than one) Proximity Logistic Space (PLS).

Expected benefits:

- Reduction of operators' delivery times thus greater productivity.
- Reduction of congestion and polluting emissions, reduction in number of vehicles entering historic centre, thus reduction of negative impacts on congestion and polluting emissions.
- Possibility of replenishing commercial activities in pedestrian areas using vehicles less dangerous for pedestrian mobility.
- Availability of cargo bikes and carts for deliveries in even less accessible areas, such as pedestrian area, reducing at the same time the need to park the vehicles near the commercial activities.
- For the future development, the possibility for transport operators to deliver goods without having an access permit in restricted traffic areas, dropping the goods in the PLS.

Measure 7: Planning for a gradual introduction of access restrictions to the city centre

Lombardy Region, through the Agreement Program for the implementation of measures on air quality in the Po Valley, foresees "traffic limitation from October 1 to March 31 each year, from Monday to Friday, from 8.30 until 18.30, with essential exceptions, for private and commercial vehicles of category N1, N2 and N3 with diesel fuel, and of lower or equal Euro 3 category". The limitation is extended to Euro 4 category by October 1 2020 and to Euro 5 by October 1 2025, and applies primarily in urban areas of municipalities with a population of more than 30,000 inhabitants.

Expected benefits: One of the first benefits is the reduction of direct CO_2 emissions, polluting atmospheric gases and noise pollution, shifting from more to less polluting vehicles circulating in the city centre and improving liveability of the urban area. The revision of access schedules and modalities on the one hand will provide an incentive to speed up the renewal process of the vehicle fleet, and on the other will allow the management of supplying process avoiding high concentrations in a few time slots.

Measure 8: Reorganization of loading/ unloading areas in the city centre

The measure aims at redesign of loading bays with development of areas with insufficient parking spaces, and implementation of services for operators, such as recharging electric systems, surveillance systems, deterrent systems for illegal parking, possibility of booking loading bays, etc. Expected benefits:

- Reduction of loading/ unloading time;
- Better usability of infrastructures;
- Reduction of traffic congestion in the city centre;
- Reduction of breaking of the road rules.

Measure 9: Permanent Freight Quality Partnership

The FQP measure is a tool that can guarantee a constant dialogue between different actors involved in the decision-making process, and in the implementation of solutions for the improvement of logistics system in Brescia FUA.

Expected benefits: The main expected benefit is the establishment of a win-win model, where both community and private operators' interests are safeguarded, with reduction of negative externalities and improvement of productivity conditions. Moreover, the FQP can ensure a constant monitoring of the implementation of the measures, and if a problem occurs in the implementation, the adoption of corrective measures shared by the stakeholders. The more participated the approach in the identification of solutions related to logistics, the more the perception of the topics will be changed in the public opinion, which currently sees the city logistics and in general the transport of goods in urban areas only and exclusively as a problem.

Municipality of Maribor is located in the north-eastern part of Slovenia within the FUA of Podravje. The FUA is comprised of 41 municipalities each governed by its own mayor and council. As Slovenia does not have regions nor regional governments the adoption of SULP on the FUA level would require the consensus of all 41 municipalities which is by itself an impossible task. Considering the outcomes of SULPiTER analytical tool showing that the Municipality of Maribor is the main origin and destination of freight traffic flows in the region, the SULP was developed only for the Municipality of Maribor. However, it needs to be stressed that Maribor's SULP contains a set of measures indirectly and partly influencing also other parts of the FUA.

Sustainable urban (logistics) planning in Maribor

In 2015, the Municipality of Maribor developed and adopted a Sustainable Urban Mobility Plan, which determines the priorities for development in the field of urban mobility. SUMP was developed according to EU methodology and is in line with the practices of European cities. Therefore, it mainly deals with the segment of people and passengers. Despite this, it is somehow more advanced in one segment - as part of the fifth pillar it partly addresses also the problem of rationalization of urban freight transport.

In the case of Maribor, SULP should be understood as a strategic document that supplements the SUMP, covering the specific area of city logistics. Since the guidelines for the SULP at the European and national level do not yet exist, Maribor's SULP is based on the methodology of project SULPiTER, which seeks to provide qualitative analysis of the current state and to develop strategic guidelines through dialogue with key stakeholders in the FUA.

SULP is based on the principles of sustainable development of logistics using environmentally friendly means of transport and creation of synergies with deployment of the most advanced technological and information solutions. It is built on the principles of collaboration – joint identification of solutions through new cooperation models and a continuous improvement process.

Urban freight policies and measures implemented before and during the SULPiTER project

After WWII Maribor was developing as a typical industrial town up until beginning of 1990s when Slovenia seceded from Yugoslavia. The loss of the Yugoslav market severely strained the city's economy resulting in a record unemployment rate of nearly 25%. Since then Maribor is in process of regaining its identity as economic and cultural capital of the re-

gion. This turbulent history affected also the freight transport, predominantly in relation to city centre where different access restrictions and entering systems were in place. At present only freight vehicles with a maximum mass of 7,5 t are allowed to enter city centre while more strict access rules are implemented to the historical city centre (pedestrian zone). Access to pedestrian zone is limited to freight vehicles up to 5 t permissible maximum mass within limited time slots (between 5 a.m. and 10 a.m. and between 8 p.m. and 10 p.m.) and only with permit (issued by the Sector for Public Utility and Transport at the Municipality of Maribor).

During the preparation of SULP (and according to the analysis done for the city Centre) Maribor's authorities have modified the time slots. Entrance to the pedestrian zone is now set to 9:30 a.m. and exit from the pedestrian zone till 10:00 a.m. After 10:00 entrance to pedestrian zone is possible exclusively for delivery for construction purposes, for service and courier activities, for electric vehicles, for transport to the nearest loading bay within the pedestrian zone, and for some other exceptions.

Within the city centre loading bays for freight vehicles are positioned, allowing stops for up to 20 minutes. Delivery from the loading bays to the end users' facility is done with trolleys or on foot. Based on the analysis made by the SULPiTER project team, new loading bays where positioned on routes entering city centre as these bays were mostly occupied.

There are also some private practices connected to the means of delivery. Some logistics service providers have already upgraded their fleet according to valid decree, and today they carry out deliveries to the city centre mainly with electric vehicles. Some other suppliers have started delivering parcels outside the delivery times with freight delivery bicycles. Some business in pedestrian zone voluntarily carry out their deliveries before 8 a.m. to minimize impact of freight traffic minimizes and to clear the streets for pedestrians.

Understanding

Survey on distribution flows

The SULPiTER Survey on distribution flows of different types of commercial entities (retail, Ho.Re.Ca, small shops (crafts) and home accessories) in city centres has shown that commercial entities have rather modest share of surface dedicated to warehousing (vast majority in the range up to 20m^2). This indicates that deliveries need to be very frequent and inventories are not substantial. Deliveries are mainly managed, organized and performed by goods' suppliers. The share of self-replenishment at commercial entities is very low and there are actually no cases of off-truck supply. Commercial entities have rather small number of suppliers (predominantly 1 or 2). This is characteristic for smaller shops with specialised goods and for bigger retail stores, which consolidate all the goods at distribution centres. Deliveries

are made mainly to the shop of commercial entities. Only very small share is delivered to external depots. Commercial entities located in the city centre seldom use external depots with exception of some specialized businesses – e.g. flower shops that need depots with cooling options for larger quantities of flowers. Packages are predominantly medium or small in size. Only few deliveries include large packages and even smaller number have to do with pallets and roll cage pallets (RLCs). This indicates that deliveries could be possibly done on foot or by freight bicycle. Lightweight packages (up to 5 kg) are characteristic for shipments to urban centres. This again correlates to previous findings and possibilities for innovative urban freight delivery options. Majority of commercial entities receive shipments containing small number of packages (up to 5). This again is indicative of frequent orders of smaller number of packages in order to avoid inventories.

In the majority of cases, we can notice single daily (one delivery per day) or weekly (three times a week) deliveries. Some commercial entities have up to 6 daily deliveries originating from bigger number of suppliers used by these entities. Moderate sample of commercial entities have deliveries twice or three times a week, the same holds true for monthly deliveries. A big number of deliveries is caused by commercial entities not holding inventories thus orders/deliveries need to be more frequent. The biggest share of deliveries is performed with vehicles from 1,5 to 3,5 tons with mainly diesel fuelled EURO 5 engines. 29% of deliveries are done with personal vehicles with up to 1,5 tons.

Majority of deliveries are performed in the early morning period when vehicles are allowed to enter city centre/pedestrian zone. In the afternoon, when access to the city centre is restricted and only selected express courier companies are allowed access, number of deliveries is considerably lower. Delivery time is limited to fixed morning time slots and fixed afternoon time slots with no other options. The customers require more options for deliveries outside present time windows. In addition, initiatives for delivery coordination among suppliers are lacking, issues with cargo security at delivery have been noticed.

Survey on Transport operators flows

The survey on Transport operators' flows was focused mainly on transport operators engaged by bigger retail chains. The survey done in the FUA Maribor revealed some interesting characteristics. The number of stops on one trip depends upon a commodity that is being transported. For retail (groceries) vehicles realize up to 9 stops per trip (on average 3 to 4 stops), in case of pharmaceutical products even up to 20 stops per trip are realized. Quantity also depends on the type of commodity being transported, on average the whole shipment weights approximately 10 tons but when considering deliveries to city centres, which are limited to vehicles with up to 3,5 tons, average shipment weights about 1,5 tons (and usually only small part of it is shipped to customers in the strict city centre).

Analysis of statistical data

In addition to survey on transport operators' flows, analysis of statistical data (data collected by Statistical office of the Republic of Slovenia) on transport operators was done. This allowed for deeper understanding of share of different vehicle types, a total number of trips, total quantity of goods transported and information relevant for generating OD matrices. Results of the load factors analysis in relation to number of trips are of special importance for they show that approximately one-quarter of vehicles travel empty and an additional half of vehicles are utilised below 30% of capacities. Only 15% of all vehicle trips are performed with fully loaded vehicles. Very similar results are evident for trips between zones of the FUA Maribor. This indicates to the need to consolidate goods and to optimise vehicle trips.

Analysis of traffic counters

Moreover, the analysis data from traffic counters was done and it shows that freight traffic is growing on all main intersections and roads to the city centre. The highest growth is recorded for light delivery vehicles (< 3,5 t), the number of these vehicles increased on average by 16,06 % (3,2 % p.a.) in the period from 2013 to 2017. The volume of heavy freight traffic (> 3,5 t) increased on average by 4,26 % (0,85 % p.a.) over the same period.

OD matrices of transport flows

More detailed analysis was done for the Foodstuffs and Home accessories supply chains. For the Foodstuffs, two zones of Maribor FUA are of major importance, MC (Maribor City) with 209,8 tons/day and GU3 (zone of Ptuj and surrounding towns) with 244,4 tons/day. Freight flows between zones and intra zonal flows in other regions are much less relevant in this respect. What concerns the Home accessories supply chain, quantities of two most important zones (MC and GU3) are still prevailing in terms of intra zonal flows: MC (42,3 tons/day), GU3 (31,1 tons/day) and flows between zones MC-GU3 (35,1 tons/day).

Data on origin and destination of trips within FUA and between GUs shows, that more than a half of trips is generated or distributed in Maribor. The biggest share of

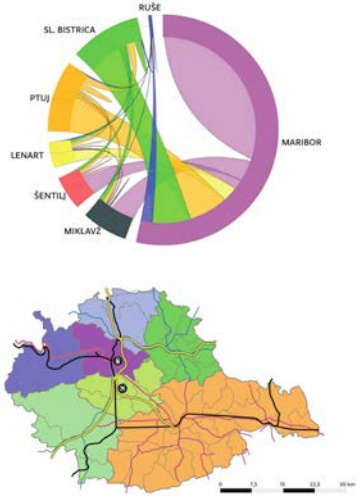

Figure 6: Origin and destination of LGV and MGV among zones of FUA Maribor

vehicles to be assigned on the road network are MGVs in the morning period (246 vehicles in total), followed by LGVs in the morning period (61 vehicles in total), MGVs in the afternoon period (44 vehicles) and LGVs in the afternoon period. At this point it needs to be emphasized once again that this represents only two supply chains which are most relevant for distribution flows in the region. Total number of freight vehicles to be assigned on the network is substantially bigger.

Participatory process

FQP was perceived as one of the most important mechanisms of the SULP development process in Maribor. In the initial phase, several discussions were done with the public authorities to define aims and objectives of FQP and to understand the existing policies and logistics vision of the Municipality of Maribor. Private stakeholders were engaged in later phases as to provide their views and to confirm ideas discussed with public authorities at the beginning of SULP development process. All the analyses conducted during the initial phase of the SULPiTER project (survey with shop owners, transport operators, analysis of statistical data and traffic counters) presented basis for discussions with FQP members. In addition, LSI tool was used during the FQP meetings to further identify the most crucial problems and measures to be addressed in the SULP document.

Challenges and measures

The survey conducted within FQP Maribor revealed the following strategic challenges: transport and mobility, environment, economy, society, planning, user's acceptance and acceptance by inhabitants. The priority challenge is the impact of logistic processes on efficient transport system.

On an operational level, the main challenges are related to:

- delivery (incorrect parking of other vehicles hindering the delivery on roads, lack of loading bays, bad signalling, to narrow delivery routes in city centre, no priority delivery routes, inappropriate time windows and delivery times),
- logistic infrastructure (logistic centres, urban consolidation centres, no multimodal connections, lack of warehouses and storage areas, no alternative to road delivery, lack of transhipment facilities – especially in the city centre),
- vehicles (low percentage of environmentally friendly vehicles - for delivery, supply and garbage removal, no vehicles appropriate for city centre including pedestrian area e.g. cargo bikes, electric vans,
- packaging (inappropriate packaging, damaged packages);
- administrative procedures and services (long and complicated transhipment and administrative procedures, no clear strategy on allowances for city centre entering including price, permissions and abuse).

In collaboration with FQP members the following measures, to be implemented in the following 5 years are proposed:

- City logistics manager: Municipality of Maribor will employ one person that will act as a city manager responsible for logistics activities.
- Management of loading bays: Number and the location of loading bays will be revised, access to loading bays will be regulated - reservation/booking, enforcement).
- Delivery areas and routes: Intervention/delivery routes will be identified and marked (map will be provided).
- Urban freight consolidation: Feasibility study for establishment of one or several urban consolidation centres (critical mass of users and different business model will be studied).
- Advanced ICT services / Route optimisation: ICT platform will be developed and implemented. It will contain route finder and reservation of delivery loading bays. It should support the supplier in planning, dispatching and tracking the deliverables and on the other side provide the costumers with information on the status of deliverables and about estimated time of arrival (ETA).
- Green logistics solutions / Cargo bike sharing / Electric delivery vehicles / Tax incentives: E-van sharing and cargo bike sharing system will be introduced for deliveries within the city centre covering main freight generation areas. Support for tax incentives for companies with environmentally friendly vehicles - stimulating transport operators to procure e-vehicles.
- Stakeholders' collaboration: The FQP in Maribor is to be understood as informal association (formally the group will act within the framework of the Smart City Initiative) which currently consists of 28 members from both public and private sector. Long-term vision is to continue active discussions (permanent) with FQP members and to jointly deal with problems and identify solutions for urban freight.
- Enforcement: Enforcement (penalties) to be reinforced alongside measures providing alternatives for end users.
- Delivery time windows: Time windows to be more flexible and to allow also delivery and garbage removal during the night in city's friendly zone.
- Education and training: Municipality of Maribor will provide support in training of small logistics companies on the importance of economical driving, tachographs and removal of hazardous roof loads from freight vehicles (snow and ice build-up). It will also organize site visits to cities implementing different freight related measures.
- Support local economy: Long term cost reduction for logistics processes, new logistics facilities and new services.

The Poznań Functional Urban Area is located in central-western Poland, in the central part of the Wielkopolskie Province. The Poznań FUA region includes 22 functionally related communes.
The above territorial division was illustrated by the Poznań Metropolitan Area Association, which commissioned the development of the Sustainable Urban Mobility Plan for the Poznań Functional Area.
Poznań is a city with county rights in western Poland. It is located on the Warta River and is the fifth largest city in Poland in terms of population and eighth in terms of surface area. It covers an area of 3,082 km^2, but the surveys covered only 5 districts of the City of Poznań with a surface n area of 258.66 km^2. The Poznań FUA has 1,022,844 inhabitants, and in the area covered by the survey the number of inhabitants was 532,246.
The City of Poznań pays special attention to public transport and passenger vehicle traffic. The next step is the implementation of measures aimed at improving the quality of freight cargoes.
Poznań FUA Objectives may be presented as follows:

- achieve an effective collaboration between administrations and stakeholders to develop a less fragmented strategy for FUA logistics
- 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

The survey was carried out between 14 and 28 of November 2017. The method applied was the direct interview by means of paper questionnaires filled out by interviewers (PAPI – Paper-and-Pencil Interviewing) on a sample of 302 entities from the following fields:

- wholesale trade (excluding the wholesale trade in motor vehicles),
- retail trade (excluding wholesale trade in car vehicles),
- housing and services associated with alimentation,
- services and handicraft.

Fig.7 Poznań FUA

Fig.8 The five zones of the City of Poznań

The area of survey was the City of Poznań divided into 5 zones/areas referring to the former division of the city into districts. The adopted division of the city is presented on the graph.

Below are presented key findings and observations coming from the Poznań FUAs research:

- The vast majority of the surveyed entities have a small number of employees, which may be due to the specific nature of the analysed industries and result of the Poznań enterprises structure. There is no difference in terms of employment compared to other surveyed companies from gastronomy and hotel sectors
- The surveyed companies have very limited areas. The premises of almost every 4 companies surveyed were less than 20 m^2. At the same time, the largest premises belong to the trade and gastronomy sector.
- The surveyed entities generally do not have external warehouses. The stock-keeping function is performed by almost exclusively small premises located in companies.
- Less than half of the respondents indicated that the company owns a company car / car used to carry out its statutory tasks and supplies of goods. Passenger cars dominate the fleet. Every 4 company has a van.
- 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.
- The delivery, security, customs coverage, etc. is usually the responsibility of the outside company, who is the supplier of the goods to the store / seat of the company. This implies that most of the supplies are made by means of vehicles owned by major suppliers or courier companies.
- Most deliveries are made at least a few times a month, with one third 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. The declarations of the surveyed companies show that the delivery is generally short (up to 10-20 minutes) and the delivered goods do not exceed several tens of kilograms.
- Sometimes, companies notice fluctuations in supplies. They usually perceive it in the holiday season (winter / spring). Also relatively constant are delivery hours, the peak of which is between 8 a.m. and 12 p.m.
- Only a small proportion of respondents sell directly to customers. They usually use their own vehicles or use transport operators services.

■ Among the most frequently reported supply problems, respondents indicate difficulties in accessing loading and unloading sites. The sense of security of the goods suffers from that and delivery times are prolonged.

In order to identify and analyse possible solutions having a positive impact on freight traffic in the city of Poznań, research of preferences of transport process participants was carried out. For this purpose, an online survey was prepared using the Google Form. The questions for the survey were based on consultations held in the framework of FQP partner meetings. The gathered participants selected 28 examples of solutions successfully implemented in other European cities, which could be implemented in Poznań.
In Poznań, 5 meetings of FQP partners were organized, within the framework of which cooperation between representatives of business, local authorities and representatives of research centres was assumed. FQP had played an important role in proposing measures and solutions for the development of SULPs. All members agreed that the situation requires mutual cooperation with the view to finding a common position on urban freight transport.

Fig.9 FQP Meeting in Poznań

Based on further discussions and analyses within the FQP framework, 7 priority measures have been recommended for implementation in Poznań:

1. Interactive digital map for suppliers
2. Construction and organisation of work of municipal cargo consolidation centres - so-called mini hubs
3. Electronic platform combining the demand and supply of transport services in the city
4. The so-called last mile deliveries using vehicles powered by alternative energy sources
5. Silver economy - logistics solutions created for the elderly
6. Low emission zones
7. Unloading bays

It is assumed that the provisions of the SULP will be used in the process of updating the SUMP for the Poznań FUA 2016-2025 and in creating a new SUMP for the City of Poznań only.
The following steps are planned in order to achieve the objectives of including SULP in the updated SUMP for the Poznań Metropolitan Area and the new SUMP for the City of Poznań:
The new SUMP for the City of Poznań and the updated SUMP for the Poznań FUA (which will include aspects of strengthening regional freight transport included in this SULP) will be subject to public and internal consultations.
After taking into account all comments and recommendations, the SUMP for the City of Poznań will be adopted by the Poznań City Council, while the SUMP for the Poznań FUA will be adopted by the Poznań Metropolitan Area Association.
It is planned that the procedure of updating the SUMP for the FUA of Poznań and creating a new SUMP for the City of Poznań will start in 2019. Moreover, the process of creating the SUMP for the City of Poznań will be initiated by a relevant Resolution of the Poznań City Council, which is planned to be adopted by mid-2019.

RIJEKA

FUA Rijeka

Rijeka FUA covers the majority of the municipalities surrounding the City of Rijeka and Rijeka as well. The total area of the Rijeka FUA 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 total number of inhabitants in the Rijeka FUA is 202 169.

FQP in Rijeka

The freight quality partnership established in Rijeka FUA as a part of SULPiTER project has marked the first time that the private stakeholders were included in meetings regarding freight traffic and that their opinions were taken into account. Five FQP meetings were carried out in Rijeka FUA. Members varied from regional and local authorities, representatives of higher research, private companies and members of the traffic police. The measures proposed in the FQP in Rijeka were included in the SULP document; between 11 measures proposed 7 are recognized as a priority. FQP meetings have helped to establish better understanding of the freight transport in the city, they were crucial for the engagement of the private sector, and also helped to familiarize the decision makers with urban logistics.

Objectives of Rijeka SULP

In Rijeka SULP we wanted to improve the main corridors of cargo delivery towards the Port of Rijeka and, as a second goal, to improve the logistics system regarding goods delivery within the center of the city.
Some of the main objectives of the Rijeka SULP are:

- To ensure good traffic connection of the Functional Region of Northern Adriatic with TEN-T transport network (all types of traffic);
- Improve transport accessibility and availability (international, national, regional, micro-regional) of the entire area of functional region of all traffic branches, taking into account the principles of development of efficient, optimal and sustainable transport system;
- Reducing the traffic of motor vehicles in urban areas to reduce environmental impact;
- Introducing vehicles of low or zero gas emissions in the logistics delivery system of Rijeka;

- Introducing IT solutions for control and management of the delivery system in the City;
- Harmonizing supply regulations adopted by the City of Rijeka with these specific objectives and measures

Measures proposed in Rijeka SULP

The identification and analysis of possible measures and solutions that will be applied by the local government depend on the results of the analysis of logistics processes, and determined deficiencies that must be corrected. There are a number of measures aiming at promoting equal and sustainable flow of the logistic process:

- Introducing low carbon emitting vehicles for Last Mile Delivery - cargo electric bicycles or tricycles;
- Delivery outside peak hours - delivery is performed at night, or at the time when the daily traffic is at weakest
- Organization of logistics processes - complex logistics chains, such as container transport for the container terminal AGCT Brajdica, substantially burden the transportation infrastructure and require the active involvement of disparate participants (Luka Rijeka, AGCT, Port of Rijeka, shippers, carriers, etc.);
- Harmonizing delivery regulations with other regulations related to traffic - local authority decisions on traffic regulations must be coordinated with other local regulations on delivery;
- Introducing IT solutions for control and management of the delivery system - includes on-line control of the occupancy of parking space.

Main issue that Rijeka SULP aims to solve through the identified measures is the development of ecologically acceptable cargo transport in Rijeka FUA.

SULP adoption

By adopting the SULP on local, regional or national level it is guaranteed the implementation in accordance with the general interest of the whole society, not just interested individuals. By integrating SULP with SUMP it will be achieved the compliance with the overall strategy of sustainable development of transport in certain area. SULP should be seen as an integral part of SUMP, therefore, the two plans must have a common basis or SULP, as the plan of a lower order, must act according to basic guidelines of SUMP. The link between the two can be flexible, and can be defined in different ways and to connect on different levels, depending on the overall goals of urban logistics.
In that sense, the SULP proposes measures for implementation, which are compatible with the objectives and measures set out in the Master Plan for Developing the Traffic System of the Functional Region of Northern Adriatic. Primorje-Gor-

ski Kotar County as a leading partner, in cooperation with partners carried out activities to create a Master Plan for Developing the Traffic System of the Functional Region of Northern Adriatic based on the Partnership Agreement which was signed by Primorje-Gorski Kotar County on May 30th 2016. Its development, which is currently underway, is conditioned by the necessity of further sustainable development of the mentioned areas, in accordance with economic and social objectives and needs to improve living conditions, environmental protection and preservation, achieving energy savings and energy efficiency and other sustainable development goals.

The City of Rijeka is one of the most important stakeholders of the entire drafting process because the City of Rijeka is a traffic and economic focus of the functional region, and is involved in the development process through its professional representatives.

The Master Plan for Developing the Traffic System of the Functional Region of Northern Adriatic will be applied for the period until 2030 (in accordance with the Transport Development strategy of the Republic of Croatia 2014-2030), and the Plan needs to be made by December 31st 2018. Since the said Plan will contain the essential elements of the logistics system, which is subject of this SULP, it is important that these plans be coordinated in key logistic elements.

The Sustainable Urban Logistics Plan in the Stuttgart Region

The Stuttgart Region has a very successful industry. Actually, the region is one of the few areas in Europe in which industry is a main contributor to regional income. In addition, we experience strong flows of in-migration and an increase in population. As a result, we have serious land use and traffic problems on all levels, and these problems are increasing. We also face air pollution and noise problems, for which we must find sustainable solutions in order to ensure the necessary mobility of people and goods.

This was the situation when the work on the Stuttgart SULP started. We consulted with courier and parcel delivery services, general cargo carriers, towns, and of course with the responsible persons of the Stuttgart Region. In parallel, we held meetings of the FQP. At the first meeting, we introduced the SULPiTER project, on the second and third meeting, we got closer to individual SULP topics, and on meetings four and five, we debated the SULP draft.

The meetings defined the structure of the SULP. In retrospective, it is not very systematic. That has to do with the appearance of measures, coming up from FQP members according to their knowledge and interest, and from the measure collection of the authors of the draft. It may therefore be better to demonstrate the content by the categories used in the policy document.

- Regulation related measures: Parking bays and private loading space.
- Technology related measures: Introduction of cargo bikes and of new vehicle constructions.
- Infrastructure related measures: Micro depots, packing stations for commercial recipients, electric power generation and storage, charging infrastructure, truck fuelling, interfaces between transport modes (terminals), space for logistics (locations).
- Services related measures: Wide range of measures regarding delivery points, delivery of beverages.
- Energy related measures: Here, one can again list the measures regarding e-mobility.

Many of the measures fall into several categories, and the main listing is somewhat arbitrary. From the planners' point of view, we have often listed them under infrastructure, because that is where the regional responsibility is.

This leads to the point that the SULP was heavily influenced by the thought that it must be possible to introduce the measure locally, and to influence goods transport towards sustainability. It needs participation of the region's large and medium towns. There was no way to force anything upon them, since under German constitutional law, the responsi-

bility for planning as a default is at local level. The rule of thumbs for successful implementation therefore is: The less force is applied from above, the more gets done on local level.
Therefore, we evaluated the measures regarding their complexity and their chance to get implemented on short notice. Here is an example of a measure that can easily be implemented, according to the evaluation matrix:

Example: Parking bays for delivery vehicles
Some parking bays are to be reserved for delivery vehicles. This needs cooperation between local administration and the logistics sector to determine those locations as solutions, where such parking bays would improve the traffic situation and reduce traffic as well as congestion.

TRAFFIC	MORE STEADY
COSTS (to the economy as a whole)	ABOUT NEUTRAL
EMISSIONS	DECREASE
TIME HORIZON	SHORT TO MID TERM

And here is an example that will take more considerable efforts for implementation:

Example: Charging infrastucture
The capacities of the electric power grid do not allow fast charging of masses of vehicles.
This is a problem of the network's last mile that has to be actively handled and will be quite costly.

TRAFFIC	NEUTRAL
COSTS (to the economy as a whole)	CONSIDERABLE
EMISSIONS	DECREASE
TIME HORIZON	SHORT TO LONG TERM

We found a few unexpected measures. One was to focus on the delivery of drinking water, juice and other beverages. It appeared that in Stuttgart Region alone there is a daily mileage of 40,000 km by trucks of all sizes in order to bring drinks into stores or to consumers, not counting the miles of consumers to carry the bottles and cans home from the stores. This requires action.

Since the regional traffic and transport plan has just recently been adopted via the regional parliament and after intensive public debate, there is no way to integrate the Sustainable Urban Logistics Plan into the traffic and transport plan. However, we will use it as a supplement, and expect that new measures will be found through the implementation process.

V. Contribution to the Macro Regional Strategies

The Macro Regional strategies are an integrated framework endorsed by the European Council which allows countries located in the same region to jointly tackle and find solutions to problems or to better use the potential they have in common thereby benefiting from strengthened cooperation, contributing to the achievement of economic, social and territorial cohesion. The EU Macro Regional strategies can be supported by EU funds, including the European Structural and Investment Funds .
SULPITER supports policy makers across the Interreg Central Europe Programme area and beyond in improving their understanding of FUAs freight phenomena in an energy and environmental perspective. The project contributes to enhancing capacities in urban freight mobility in order to develop and adopt SULP. For this reason, the project is approaching MRS that represent the ideal nexus to foster the uptake of innovative approaches to urban logistics.
The experience of SULPiTER in different cities of Central Europe provides a valuable input for the further development of Macro Regional Strategies when defining transport and mobility-oriented priorities. SULPiTER actions and expertise is reflected in the following input to the Macro Regional Strategies:

Raising awareness on the importance of urban freight transport for the economy

Today about 85% of the entire EU's GDP is generated in urban areas . This makes cities not only important from the population and households' point of view, but they must be perceived as the main commercial centres of our society. Efficient supply of population and commercial entities located in urban areas is therefore crucial for economic sustainability of our cities. Urban freight transport should thus be perceived as an important enabler of economic activities.
Understanding logistics trends and urban freight problems
Urban freight problems are strongly related to existing trends and expectation of consumers. Studies show that just-in-time deliveries and upward trend of e-commerce results in high fragmentation of urban freight delivery demand and supply. Cities are consequently facing more frequent deliveries and higher number of urban freight transport trips. Empirical studies reveal that freight vehicles today already contribute 10-15% of total urban vehicle-kilometres. Within urban areas low utilisation rates of freight vehicles are evident, average load factor is decreasing and is today only at the level of 30-40%. In addition to that, more than 20% of vehicle-kilometres are driven empty. These trends contribute to negative impacts on urban environment. About 25% of CO_2 emissions, 30% of nitrate oxides and 50% of particulates emitted from transport are, in large cities, generated by trucks and vans. Commercial vehicles are also contributing to over 20% of energy consumption and urban traffic congestion. In order to manage urban freight transport understanding of current state and problems is crucial if efficient policies and measures for tackling these problems are to

be implemented. Despite the fact that urban areas differ in many characteristics, facilitating systematic approach to understanding of urban freight transport issues can lead to better management of it.

Analysis of logistics/freight transport behaviours

A deep understanding of urban freight transport phenomena is a precondition for solving urban freight problems in cities and for developing sustainable policies and measures. It was noted that in European cities data on urban freight transport (number of transport missions, freight quantity, type of vehicles, utilisation rates etc.) are seldom available thus city authorities are lacking reliable basis for decisions. Data are actually needed to assess and understand current situation, to follow the progress and to better plan logistics activities in cities.

Tools developed within the SULPiTER project initiated first databases and improved understanding city authorities' understanding of urban freight transport phenomena. Although data collection process for SULPiTER pilot cities have been highly simplified, it still proved to be very challenging and time-consuming task. Therefore, automation for generation of urban freight data is suggested for the future. This would allow evidence-based policy making and constant improvement of logistics policies and processes. Processes on logistics and transport data collection should be incorporated into Smart city initiatives and objectives (ITS infrastructure, data sharing, smart space management, multi-carrier consolidation and capacity sharing, routing, interoperability etc.).

Involving stakeholders into policy making process

Public authorities sometimes have a different perception of logistics needs than industry. Increasing their technical knowledge is therefore very important for developing efficient urban freight policies. Furthermore, the business sector can have different understanding of goals and objectives pursued in adopted policies and measures. To mitigate this divergence of understandings a collaboration among various stakeholders is recommended. Involving urban freight transport stakeholders into the policy planning process and co creation of new policies and measures should result in mutual satisfaction. Based on SULPiTER experiences this type of cooperation is crucial for improvement and acceptance for it can stimulate synergies (consolidation, more efficient deliveries) and optimization without huge investments. Cooperation between policy makes and urban freight transport stakeholders should be encouraged, be it in form of Freight Quality Partnerships or other cooperation type.

Include logistics in planning processes

SUMPs adopted in many European cities, are mainly dealing with mobility of people. In most cases freight transport has not been considered or has been addressed only partially. In the absence of clear guidelines for addressing urban freight issues, cities have adopted diverse strategic documents and measures. Consequently, we are today lacking the understanding about the structure of the implemented urban freight policy measures in the European cities and their efficiency. There is a need to incorporate freight transport aspects also in the planning document.

Within SULPiTER concept of the SULPs was implemented and the concept proved feasible in various forms – be it as part of SUMP, as annex to SUMP or as standalone document. However, prior to development of SULP it is highly recommended to develop & use tools for observing and understanding city's urban freight transport and its dynamics. These observations already done in SULPiTER show that specific supply chains might need more attention (e.g.: food or construction) thus analysis needs to be focused to supply chains relevant for particular city. Certainly, cities need to define clear goals for logistics domain at support these goals with strategies. It would be advisable to define (and fund) emblematic initiative of cities for integrated paradigm shift in city logistics structure & operation in the context of a holistic approach at local level for sustainable urban logistics Action Plans implementation.

Supporting wider approach – Functional urban areas

Cities are strongly connected with their hinterlands thus supporting a wider approach to planning, considering not only city centres but also the metropolitan and/or regional level (Functional Urban Areas) could deliver higher efficiency of implemented measures and policies (strategical planning, positioning of logistics infrastructure, management of specific supply chains etc.). Formal or informal cooperation on level of functional urban areas in all aspects could advance mitigation of negative impact of urban freight transport while it could also support economic activities in such areas.

SULPITER TEAM

Fig.10 SULPiTER team at the Final Conference on 14 May 2019

REFERENCES

1 SOER 2015, European Environment Agency, “Global Mega trends – towards a more urban world (GMT2)” , 18 Feb 2015, http://www.eea.europa.eu/soer-2015/global/urban-world
2 Gonzalez-Feliu J. Models and Methods for the City Logistics: The Two-Echelon Capacitated Vehicle Routing Problem. Politecnico di Torino, 2008.
3 Quak HJ. Improving Urban Freight Transport Sustainability by Carriers – Best Practices from The Netherlands and the EU Project CityLog. Procedia - Soc Behav Sci 2012;39:158–71. doi:10.1016/j.sbspro.2012.03.098.
4 Tozzi M, Corazza MV, Musso A. Urban goods movements in a sensitive context: The case of Parma. Res Transp Bus Manag 2014;11:134–41. doi:10.1016/j.rtbm.2014.03.003
5 Lindholm M, Behrends S. Challenges in urban freight transport planning - a review in the Baltic Sea Region. J Transp Geogr 2012;22. doi:10.1016/j.jtrangeo.2012.01.001.
6 Letnik T, Marksel M, Luppino G, Bardi A, Božičnik S. Review of policies and measures for sustainable and energy efficient urban transport. Energy 2018;163:245–57. doi:10.1016/J.ENERGY.2018.08.096.
7 Cherrett T, Allen J, McLeod F, Maynard S, Hickford A, Browne M. Understanding urban freight activity – key issues for freight planning. J Transp Geogr 2012;24:22–32. doi:10.1016/j.jtrangeo.2012.05.008.
8 Taniguchi E, Thompson RG, Yamada T. Recent Trends and Innovations in Modelling City Logistics. Procedia - Soc Behav Sci 2014;125:4–14. doi:10.1016/j.sbspro.2014.01.1451.
9 Danielis R, Valeri E, Rotaris L. Performance evaluation methods for urban freight distribution chains : a survey of the literature. Urbe 2015 2015:1–21.
10 Lindholm M., Browne M. (2014). Successes and Failings of an Urban Freight Quality Partnership – The Story of the Gothenburg Local Freight Network. Procedia - Social and Behavioral Sciences 125 (2014) 125 – 135
11 Browne, M., Nemoto, T., Visser, J. and Whiteing, T. (2004). Urban Freight Movements and Public-Private Partnerships, in Eiichi Taniguchi, Russell G. Thompson (ed.) Logistics Systems for Sustainable Cities, pp.17 – 35
12 Dablanc, L. (2007). Goods transport in large European cities: Difficult to organize, difficult to mordernize. Transportation Research Part A: Policy and Practice, 41, 280-286.
13 Lindholm, M. and Behrends, S. (2012). Challenges in urban freight transport planning – a review in the Baltic Sea Region. Journal of Transport Geography, 22, 129-136.
14 European Commission (2018). Engagement of stakeholders when implementing urban freight logistics policies. Non-binding guidance documents on urban logistics N° 3/6, Study on Urban Logistics - “The integrated perspective”.
15 Lindholm M., Browne M. (2013). Local Authority Cooperation with Urban Freight Stakeholders: A Comparison of Partnership Approaches, EJTIR, Issue 13(1), pp.20-38, ISSN:1567-7141.
16 Rubini L., Della Lucia L. (2018). Governance and the stakeholders’ engagement in city logistics: the SULPiTER methodology and the Bologna application, Transportation Research Procedia 30 (2018) 255–264.
17 European Commission, ISBN 978-92-79-76613-8, (2017)
18 European Commission, https://ec.europa.eu/regional_policy/en/policy/themes/urban-development/
19 Ambrosino, G., (2015). Guidelines. Developing and implementing a Sustainable Urban Logistics Plan, ENergy efficiency in City Logistics Services for small and mid-sized European historic town (ENCLOSE project).
20 Bohler-Baedeker, S., Buhrmann, S., Rupprecht, S., Wefering, F. (2014), Guidelines. Developing and implementing a Sustainable Urban Mobility Plan, Directorate-General for Mobility and Transport (DG MOVE- European Commission)
21 Browne, M., Allen, J., and Attlassy, M. (2007). Comparing freight transport strategies and measures in London and Paris. International Journal of Logistics: Research and Applications, 10(3), 205-219.
22 European Commission (2009). Action Plan on Urban Mobility COM (2009) 490/5.
23 European Commission, COM(2011) 0144 final, White Paper, Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system, 2011.
24 European Commission, Brussels, 17.12.2013, SWD (2013) 524 final, Commission Staff Working Document, A call to action on urban logistics, Accompanying the document, Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions, Together towards competitive and resource-efficient urban mobility, 2013.
25 Marciani, M., Cossu, P., Pompetti, P., (2016). How to increase stakeholders’ involvement while developing new governance model for urban logistic: Turin best practice. Transportation Research Procedia, 16 (2016), 343–354.
26 MIT - Ministero delle Infrastrutture e dei Trasporti (2017). Individuazione delle linee guida per i piani urbani di mobilità sostenibile.
27 Quak, H., Lindholm, M., Tavasszy, L., Browne, M. (2016). From freight partnerships to city logistics living labs – Giving meaning to the elusive concept of living labs. Transportation Research Procedia 12 (2016) 461 – 473.


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